ALSPA MV3000 Demonstration Case

User Manual

for all language models
MV3000 Case Demo/E,F,D

Publication No. T1691
Issue 2 (05/01)

ALSTOM

SAFETY INSTRUCTIONS

Care has been taken with the design of this product to ensure that it is safe. However, in common with all products of this type, misuse can result in injury or death. Therefore, it is very important that the instructions in this manual and on the product are observed during transportation, commissioning, operation, maintenance and disposal.

This technical manual should be regarded as part of the product. It should be stored with the product and passed on to any subsequent owner or user.

Local safety laws and regulations must always be observed.

Persons working on the product must be suitably skilled and should have been trained in that work for these products.

The product is a component designed for incorporation in installations, apparatus and machines.

The product must not be used as a single item safety system. In applications where maloperation of the product could cause danger, additional means must be used to prevent danger to persons.

Product approvals and certifications will be invalidated if the product is transported, used or stored outside its ratings or if the instructions in this manual are not observed.

In the European Union:

- Products within the scope of the Low Voltage Directive, 73/23/EEC as amended are CE marked.
- The product complies with the essential protection requirements of the EMC directive 89/336/EEC as amended, when installed and used as described in this manual. The requirements of the EMC Directive should be established before any installation, apparatus or machine which incorporates the product is taken into service.
- A machine should not be taken into service until the machine has been declared in conformity with the provisions of the Machinery (Safety) Directive, 98/37/EEC.

Publication No. T1691 Issue 2 (05/01)

See over for diagram identifying the main case items

IDENTIFYING THE CASE PARTS

❶ Top Panel

❷ Perspex Cover

❸ CDC Board

❹ Mains Switch and Mains Inlet

❺ Case Locks and handle

❻ Finger Hole and panel catch

❼ Document & cable store

❽ * DDM™ Harbour

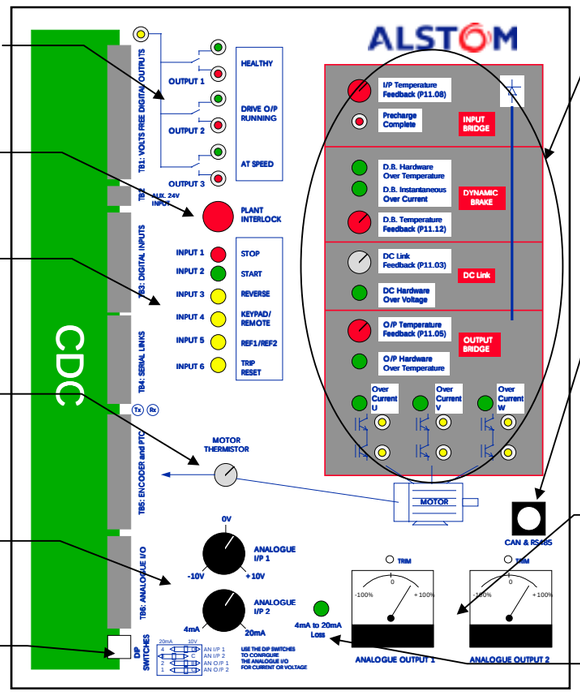
❾ * Case DDM™

❿ Bottom Panel

* Drive Data Manager™

Case Item No.	Case Item Name	Specifications
❶	Top Panel	Gives a short overview of some of the menus held within the ALSPA MV3000 Drive. This panel is intended to act as an aid to the users memory during demonstrations or training. The panel hinges forward to reveal a storage area, see ❻ and ❼ below.
❷	Perspex Cover	Covers the CDC board up to allow annotation with text, which explains what the areas of the CDC do, showing connections and enhancement areas.
❸	CDC Board	The ALSPA MV3000 Common Drive Controller board. This board is the same control PCB used in all the MV3000 drives, and runs the same firmware as the drive.
❹	Mains Switch & Mains Inlet	The power lead plugs in here and the illuminated switch is used to switch on the power. See section 2 for technical and fuse data.
❺	Case Locks and Handle	The case can be locked shut using the keys provided. The keys should be attached to the handle on delivery.
❻	Finger Hole and panel catch	Rotate the catch a quarter turn to release then insert a finger to pull open the top panel, once open the storage area ❼ is revealed. See Section 3.4.3
❼	Document and Cable Store	This area stores the following items when the case is shipped: User guide, power lead, keypad lead, case to PC lead, various data sheets on the items in the case. See Section 3.4 for a description of the case accessories.
❽	DDM™ Harbour *	The harbour is the same item used on the ALSPA MV3000 drives and is used to hold the keypad ❾. The harbour also has status LED's within it, the meaning of the LED's is explained in Section 4.6 of this guide.
❾	Case DDM™ *	The case includes a fully functional ALSPA MV3000 Drive Data Manager™ (keypad). The function of the DDM is explained in section 4.6 of this guide.
❿	Bottom Panel	The bottom panel is a fully functional plant and drive simulation area. It allows the user to emulate plant I/O and drive responses for demonstrating and training the ALSPA MV3000. Details of the bottom panel are shown below.

BOTTOM PANEL ❿ DETAILS



① Plant Digital Outputs

② Plant Interlock

③ Plant Digital Inputs

④ Motor Thermistor Simulation

⑤ Plant Analogue Inputs

⑥ Analogue DIP Switches

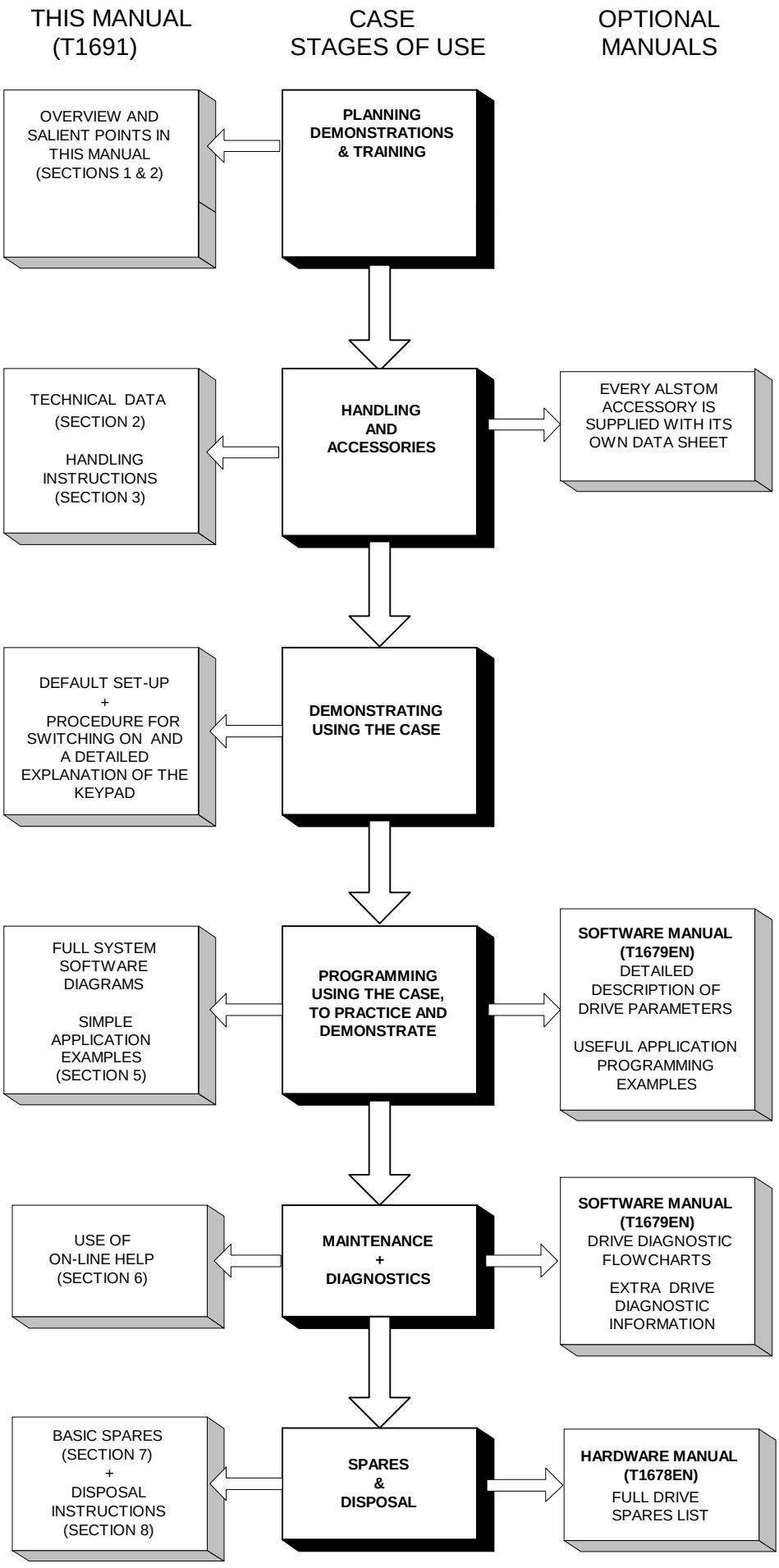
⑦ Drive Power Frame Simulator

⑧ PC to Case Serial Link Connections

⑨ Plant Analogue Outputs

⑩ 4-20mA Loss Switch

Panel Item No.	Panel Item Name	Specifications
①	Plant Digital Outputs	3 configurable volts free relay outputs. Here shown with red and green LED's. The red LED is lit when the relay is open. The labels match the default settings as shipped from ALSTOM. See Section 4.3.2 for more details.
②	Plant Interlock	The plant interlock must be made to allow the drive to run. Pressing the switch will result in the CDC ③ tripping on "interlock". See Section 4.3.2 for more details.
③	Plant Digital Inputs	6 configurable digital inputs. Here connected to illuminated switches. The labels match the settings as shipped from ALSTOM. See Section 4.3.2 for more details.
④	Motor Thermistor Simulation	A true motor PTC input. Here simulated by a 5kΩ potentiometer. The control can be used to simulate a motor overheating. See Section 4.3.2 for more details.
⑤	Plant Analogue Inputs	2 configurable analogue inputs. Input 1 is -10V to +10V, input 2 is 4-20ma. Can be used to simulate plant inputs. See ⑥ and ⑩ below and Section 4.3.2.
⑥	Analogue DIP Switches	These DIP switches are used to configure the analogue I/O for current or voltage operation. The small legend shows their use and their default settings as shipped from ALSTOM. See Section 4.3.2 for more details.
⑦	Drive Power Frame Simulator	This area is a collection of circuits designed to simulate the complete power frame of the ALSPA MV3000 drives. These controls can be used to simulate internal drive conditions and responses, as per their labels.
⑧	PC to case Serial Link Connections	The connections at TB4 have been extended to here for ease. The lead included, allows easy connection to a PC. Details are given in Section 3.4.5.
⑨	Plant Analogue Outputs	2 configurable analogue outputs. Both -10V to +10V. They can be used to simulate plant outputs. See ⑥ above and Section 4.3.2 for extra detail.
⑩	4-20mA Loss	This switch is used to switch off the 4-20ma reference from analogue input 2. When the switch is illuminated the 4-20ma reference is healthy. See Section 4.3.2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OVERVIEW AND SALIENT POINTS IN THIS MANUAL (SECTIONS 1 & 2)
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FULL SYSTEM SOFTWARE DIAGRAMS
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1. Introduction

1.1 About this User Guide in General

This User Guide provides a competent user trained in electrical installation practice with sufficient information to safely install, operate, maintain and dispose of this case. The guide deals solely with the demonstration case and what it can be used for. Detailed instructions on ALSPA MV3000 installations and programming are contained in the ALSPA MV3000 Getting Started Manual (T1676), the ALSPA MV3000 Hardware Technical Manual (T1678), and ALSPA MV3000 Software Technical Manual (T1679), which are available from ALSTOM as options.

Instructions for high power modular (DELTA) based ALSPA MV3000 drives are provided in T1689, ALSPA MV DELTA, Supplementary Technical Manual to T1641, for MV3000.

This manual should be regarded as part of the Demonstration Case unit. It should be retained for the life of the case and passed on to any subsequent owner or user.

1.2 Labelling Conventions Used in this Guide

For ease of use, the main objects and areas contained within the demonstration case have been labelled. The key to these labels can be found on the inside front cover of this guide. The number labels which have been described on the front cover, appear throughout the user guide to aid identification of the case parts.

For example: Mains switch (❹) and 4 - 20mA loss switch (⑩)

1.3 About the ALSPA MV3000 Demonstration Case

The ALSPA MV3000 Demonstration Case has been developed as a portable and user friendly demonstration unit to compliment the range of ALSPA MV3000 variable speed AC drives. The case allows the user to demonstrate features and benefits of the drive product, to train and instruct site personnel in a safe and clean environment and allows application programs to be developed and tested in a safe manner for later inclusion in plant operations. Technical personnel can be trained in the use of the drive and the Drive Data Manager, the methods of fault finding and diagnosis can be learned and refreshed and personnel can become familiar with the general environment contained within the ALSPA MV3000 without having to go any where near to live working plant. This of course ensures that maintenance teams are fully versed in the drive, and any maintenance activities can be carried out with a minimum of down time. A typical ALSPA MV3000 Demonstration Case is shown in Figure 1-1, shown with the case open.

Figure 1-1 ALSPA MV3000 Demonstration Case - open

1.4 Range of Cases Covered by this Manual

All language versions of the case are covered by this user guide, namely:

MV3000 CASE DEMO/E	The ENGLISH version
MV3000 CASE DEMO/F	The FRENCH version
MV3000 CASE DEMO/D	The GERMAN version

Dimensions and weights are provided in Section 2.1.

1.5 Use of IEC Standards

The ALSPA MV3000 Demonstration Case units have been designed to IEC standards using SI units. In this manual approximate values for inches, lb and hp are also included for convenience.

1.6 Customer Support and Training

ALSTOM provides comprehensive telephone technical support, application planning, service and customer training at the ALSPA Academy.

Contact **ALSTOM** at the address and the telephone/fax numbers shown on the back cover.

1.7 Associated Publications

T1676 ALSPA MV3000 Getting Started Manual

The manual explains how to install, commission and program an ALSPA MV3000 drive unit for basic operation.

T1678 ALSPA MV3000 Hardware Technical Manual

The manual contains detailed technical information to enable a competent user trained in drives to safely install, commission and operate, maintain and dispose of ALSPA MV3000 drive units for specific applications.

T1679 ALSPA MV3000 Software Technical Manual

This manual contains detailed technical information to enable a competent user trained in drives to safely configure the ALSPA MV3000 drives for specific applications. It includes full descriptions of the menu structure and parameters, also the serial communications systems.

T1689 ALSPA MV DELTA, Supplementary Technical Manual to T1641, for MV3000

This manual includes specifications and instructions to allow a competent user trained in drives to safely install the components of ALSPA MV3000 DELTA systems to construct DELTA drive units.

DELTA drives are a unique system of modular based drive units,150 kW to 1.8 MW in air-cooled versions, 600kW to 3.6 MW in liquid cooled versions.

2. Demo Case Technical Data

2.1 Case Technical/Environmental Data

Table 2-1 Case data

Environment	Storage	Temperature range	–25° C to +55° C
		Relative humidity	5% to 95%, non-condensing
	Transport	Temperature range	–25° C to +70° C
		Relative humidity	≤ 95%, non-condensing
	Operating	Altitude (max.)	1000 m
		Temperature range	0° C to 40° C Absolute MAX **Note:** If the case is taken from a vehicle into a building, care MUST be taken to allow time for the case temperature to stabilise, this will of course reduce the risk of failure due to condensation build-ups and stress caused to the power supply in the case.
		Relative humidity	5% to 95%, non-condensing
		Cooling air	Clean, free from dust, condensation and conductive or corrosive vapours (i.e. pollution degree 2 according to IEC 60664-1 and UL840).
		Ingress protection	IP20, (NEMA 1). Indoor use only
Electrical	Supply	Voltage range	90Vac to 264Vac single phase. The power supply then provides a regulated 24Vdc supply
		Voltage variation (on voltage range)	The voltage range above is the absolute limit to the range that the case power supply can operate.
		Frequency variation	47 Hz, 63 Hz, as per power supply specification
		Power Lead to fit IEC 3 pin mains socket.	The case MUST be used with the EARTHED power lead provided and connected to an EARTHED outlet to properly protect the user from electric shock.
		Network type	Single phase with earthed/grounded neutral (i.e. TN or TT)
	Fuses	Case Fuse	2 Amp 20mm anti-surge glass fuse to IEC 'EBC' 127. A spare fuse is supplied inside the case fuse holder which is located underneath the mains input (❹)
		Plug Fuse (UK only, to BS1362)	The fuse supplied in the plug is a standard 5Amp.
Physical Attributes	Dimensions	Case dimensions, when the case is closed and flat on a table.	H = 165mm (6.5"), W = 490mm (19.25"), D = 400mm (15.75")
	Weights	When the case contains all the cables and manuals supplied.	Max weight of loaded case 7kg (15.4lb)

2.2 Standards

2.2.1 Standards which apply to the whole case

The ALSPA MV3000 Demonstration Case complies with the standards listed below, and has been tested in accordance with the standards listed.

EMI filter

EN55022 Class B	Specification for limits and methods of measurement of radio interference characteristics of information technology equipment.

Electromagnetic Compatibility

EN50081-1	Electromagnetic Compatibility. Generic emissions standard. Residential, commercial and light industry.
EN50082-1	Electromagnetic Compatibility. Generic immunity standard. Residential, commercial and light industry.

2.2.2 Standards which apply to the case power supply

These standards were claimed by the proprietary power supply manufacturer. **ALSTOM** have not attempted to verify these claims but merely give the data as information:

EMI filter

FCC 20780 Part 15, class B	-
EN55022 Class B	Specification for limits and methods of measurement of radio interference characteristics of information technology equipment.
VDE 0878 PT3 Class B	-

Electromagnetic Compatibility

EN50081-1	Electromagnetic Compatibility. Generic emissions standard. Residential, commercial and light industry.
EN50082-1	Electromagnetic Compatibility. Generic immunity standard. Residential, commercial and light industry.

3. Handling & Accessories

3.1 Introduction

This section covers everything from opening the case, through to the accessories contained within the case and how to use the items supplied, to bring out the features and benefits of the case. This section also briefly deals with the environmental items that should be considered for the successful use of an ALSPA MV3000 Demonstration Case.

3.2 Receipt of Equipment

3.2.1 Inspection

Check the contents of the complete consignment against the Delivery Note for any damage, shortages or loss in transit. If any item is found to be damaged or missing, contact ALSTOM at the address/telephone number shown on the rear cover, quoting the following details:

- List of damaged or missing items with names and part numbers.
- Description of damage.
- Delivery Note numbers and dates, and order and item numbers.

3.2.2 Storage

If the equipment is not to be used immediately:

- Re-pack it in its original packaging material. If this is not possible it should be enclosed in polythene sheet to protect it from the ingress of dust.
- Store it in a clean, dry atmosphere, preferably at room temperature, ensuring that the storage environment meets the requirements of Section 2.1.

- If the case is unpacked in a warm environment condensation may occur. Should condensation be seen, the case should not be used until its temperature has stabilised to that of the working environment.

3.3 Handling the Case

3.3.1 Transporting the case in a vehicle

It is likely that the case will be transported in a vehicle to allow mobile ALSPA MV3000 demonstrations to take place. When the case is removed from the vehicle then taken to the area where the demonstration is to take place, the case should not be used until its temperature has stabilised to that of the working environment.

Transportation by aeroplane may result in mishandling by baggage handling staff. Inspect the case before applying power. If the case is visibly damaged, or if internal damage is suspected, the case should not be powered up and should be returned to ALSTOM for inspection and possible repair.

3.3.2 Carrying the Case

The case is housed in a strong ABS plastic briefcase. The weight of the case, including the contents supplied by **ALSTOM**, is approximately 7kg, which is below the 10kg recommended weight for a table top lift. It is therefore not recommended to put any other items into the case other than those supplied by **ALSTOM**, to ensure that maximum recommended lifting weights are not exceeded.

3.3.3 Opening and closing the case

The case has 2 locks positioned either side of the handle (❺). With the case flat on a table, Insert a finger behind each lock, at the outer edge, then pull forward, the locks will spring forward and release the case lid. Push the lid up and back until the lid is fully upright, it may sometimes be necessary to support the top panel(❶) whilst opening, as the magnetic catches holding it closed, may release.

To close the case, replace the **ALSTOM** items in the document wallet (❼), ensure the document wallet is closed and the DDM™ (❾) is in its harbour (❽). Pull the case lid forward and lower it carefully, press the outer edge of the case locks in, to fasten the case closed. The case can be locked by using the 2 keys supplied (they should be tied to the case handle on receipt).

3.4 Identifying and Connecting the Case Accessories

3.4.1 List of Case Accessories

The case contains a number of leads and accessories to allow effective demonstrations to be undertaken, this section explains what the items are and how they can be used. The accessories are stored in the document wallet (❼) area of the case. Various accessories are included, a list is provided here:

1. ALSPA MV3000 Drive Data Manager (DDM™) lead
   This is the standard lead used with the ALSPA MV3000 DDM™. The part number for this item can be found in chapter 7, spares and accessories.
   See Section 3.4.3 for an explanation of how to use and connect the lead

Figure 3-1 DDM™ lead

2. PC to demonstration case lead
   This lead comprises of an RS232 to 422 converter which is wired to a connector which mates to the PC to case connector (⑧).
   See Section 3.4.4 for an explanation of how to use the lead

Figure 3-2 Case to PC lead

3. Mains lead
   See section 3.4.5 for more information on the mains lead.
4. Data sheets for the Drive Data Manager - T1915.
5. Data sheets for the PC lead converter.

3.4.2 Opening the Document Wallet (❼)

The top panel (❶) has a finger hole (❻) milled into it. Next to the finger hole is a catch holding the wallet closed, rotate the catch a quarter turn to release it then insert a finger into the hole and pull forward, the document wallet/cable store area will be revealed.

The top panel has a strap to prevent it from falling fully open.

The case user manual, data sheets, power lead and accessories are housed here.

Figure 3-3 Case with Document wallet (❼) open

3.4.3 Connecting the Drive Data Manager (DDM™) lead

This lead is designed to be used with the ALSPA MV3000 DDM™ . The lead allows the DDM™ to be mounted on a cubicle door or allows the user to hand hold the DDM™ .

Connect the special lead as shown in Figure 3-4, looping the cable around the groove provided then underneath the “ear” on the cable connector. If done correctly, the DDM™ should lie flat on its back on a table.

Figure 3-4 Showing how to connect the lead to the DDM

The other end of the cable should be connected to the 9 way “D” connector on the DDM™ Harbour (❽).

Figure 3-5 shows the DDM™ connected in this way.

Figure 3-5 Showing the DDM connected via the cable

3.4.4 Connecting a PC to the demonstration case (⑧)

The case can be connected to a PC using the lead provided, simply plug the lead into the PC to case connection (⑧) on the bottom panel, and into the back of the PC.

This will allow interactive demonstrations with other **ALSTOM** products, for example SCADA tools and the drive configuration tool, ALSPA Drive Coach.

Figure 3-6 Showing the Case connected to a PC

The lead can also be separated, removing the RS232/422 converter, thus allowing direct connection to the RS485 connections on TB4 of the control PCB. This will allow the case to be connected to **ALSTOM** HMI products, again allowing the case to perform interactive demonstrations. Section 4 of this guide will give an outline of how to program the case to achieve these communications connections.

The following pin-out is provided to allow other items to be connected to the case successfully:

TB4 on CDC	7 way CAN&RS485, PC to case connector (⑧)	9 way "D" Type connector
TB4/1 (Tx+)	1	2 (RxA)
TB4/2 (Tx-)	2	7 (RxB)
TB4/3 (Rx+)	3	8 (TxA)
TB4/4 (Rx-)	4	3 (TxB)
TB4/5 (GND)	5 (connect to screen)	Not Connected
TB4/6 (CAN HI)	6	Not Connected
TB4/7 (CAN LO)	7	Not Connected

If the lead is separated, care must be taken when re-assembling the lead for PC operation. The lead must be plugged into the RS422 end of the converter, leaving the RS232 end free to connect to the PC, Figure 3-7 shows the connector assembled correctly.

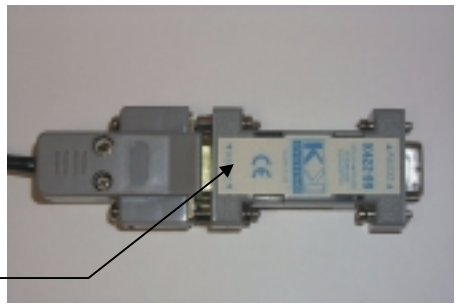


Figure 3-7 The PC lead correctly assembled

3.4.5 Mains Lead

The case is supplied with a 3 pin IEC style mains lead. The language version of the case, determines the kind of plug connected to the mains lead supplied:

MV3000 CASE DEMO/E	ENGLISH version	UK style fused plug
MV3000 CASE DEMO/F	FRENCH version	Continental plug
MV3000 CASE DEMO/D	GERMAN version	Continental plug

The mains lead is earthed and MUST be connected to an earthed power outlet for safety reasons.

4. Switching On and Demonstrating

4.1 Introduction

This section will explain the case switch on procedure, the use of the DDM™ , connection of the case to a PC or other serial linked items, hints on how to use the case to demonstrate and a brief explanation of the ALSPA MV3000 software environment to allow effective demonstrations/simulations to be made.

When the case leaves the factory it is programmed with sensible default values for all parameters, these defaults are of course exactly the same as the ALSPA MV3000 drive.

4.2 Switching the Case On

Before powering up, ensure that the case has been placed on a flat surface and opened as per Section 3.3.3, and the case has been transported to the demonstration place in accordance with the recommendations made in Section 3.3.1.

Power the case up by carrying out the following basic steps:

1. Open the case, see Section 3.3.3
2. Ensure all the potentiometers in the power frame simulator (⑦), are all in the 12 O'clock position.
3. Ensure the green switches in the power frame simulator (⑦), are all ON (pressed in).
4. Ensure the green switch labelled 4-20mA loss (⑩), is switched ON (pressed in).
5. Ensure all the plant digital input switches (③) are all OPEN (up).
6. Ensure the Drive Data Manager (❾), is in its harbour (❽).
7. Connect the mains lead to the power inlet (❹) and a suitable supply.
8. Switch the mains power on using the illuminated switch (❹).
9. The case will power up, The yellow LED near to the plant digital outputs (①) should be on, the DDM™ (❾) should power up and eventually display P1.00.
10. The CDC board (❸) should be healthy, and this can be determined by the green healthy/standby LED on the DDM™ (❾), the rear cover of this guide has a picture of the DDM™, so the healthy/standby LED can be identified.
11. If the case does not power up healthy, it is possible that the parameters stored in the CDC board (❸) are not at their default settings. Carry out the procedure described in Section 5.1.9, then repeat the power up procedure before referring to the diagnostics section of this guide.

4.3 Uses and Features of the Bottom Panel (⑩)

4.3.1 Introduction

The bottom panel is the part of the case where the "plant" and the ALSPA MV3000 power frame has been simulated, for demonstration purposes, this allows the case to perform the function of a drive as fully as possible. The bottom panel is split into 3 main areas, they are briefly described below:

1. Plant I/O Areas ①②③④⑤⑥⑨⑩ Pre-wired plant connections.

   LED's , illuminated switches and potentiometers have been fitted to the case and wired to the CDC board (❸) customer inputs. This "plant" wiring has been connected to the CDC Board (❸) in exactly the same configuration as described for the ALSPA MV3000 drive in its default configuration. The labels match this default set-up. This default configuration is described for reference in Section 5.1.10.

2. Power frame simulation Area ⑦ Takes the place of a real drive.

   Key circuits on the drive have been reproduced to allow the monitoring and diagnostic functions of the ALSPA MV3000 to be demonstrated. Illuminated switches, LED's and potentiometers are used to simulate feedbacks and trip signals.

3. PC to case connection Area ⑧ Connection to CAN & RS485

   Via the lead, described in the accessories section of this guide, a PC can be connected to the case.

4.3.2 Using the Plant I/O Area (①②③④⑤⑥⑨⑩)

The following section describes how these controls and switches can be used. The labels on these controls match the default set-up for the CDC board (❸), which of course matches that of the default ALSPA MV3000. For this explanation to work, the CDC board (❸) needs to be at default, see Section 5.1.9 for the defaulting procedure.

Use this table to understand how the controls are connected, so that bespoke programming and changes during demonstrations can go smoothly. Sections later in this guide give a brief overview of how to use the case to develop new ALSPA MV3000 programs.

Note: The case output is the simulated IGBT bridge represented by the 6 YELLOW led's which are mounted within the power frame simulation area (⑦).

Table 4-1 Details of the Plant I/O Area

Panel Item No.	Panel Item Area	Specific panel name	Function / Use in the case (@ default)
①	Plant Digital Outputs (MENU 7)	OUTPUT 1 healthy	ON - Green - The case is healthy OFF - Red - The case has tripped
		OUTPUT 2 Running	ON - Green - Output is running OFF - Red - Output is NOT running
		OUTPUT 3 At Speed	ON - Green - Output at speed OFF - Red - Output NOT at speed
②	Plant Interlock (used for emergency stops)	Interlock	A normally closed push button which is wired to the CDC board (❸) interlock input, when pressed (opened) the case will trip on "interlock" trip, as per a real plant Emergency stop. Releasing the button re-closes the interlock input allowing the case to be made healthy via a reset.

Panel Item No.	Panel Item Area	Specific panel name	Function / Use in the case (@ default)
③	Plant Digital Inputs SEE CONTROL BLOCK DIAGRAMS - SHEET 2 - AND CONTROL FLAG DATA IN SECTION 5	INPUT 1 Stop only works in Remote, see INPUT 4	ON - lit Red - When set to “remote”, the stop circuit is “made” and the case output is able to start. OFF - not lit - A remote stop is issued
		INPUT 2 Start only works in Remote, see INPUT 4	ON - lit Green - When set to “remote”, a start request is issued, the case output will start if the stop circuit is made. OFF - not lit - The output will remain started (latched) if pressed and released. Note: This input should be pulsed ON then OFF to perform a start (if stop made).
		INPUT 3 Reverse	ON - lit Yellow - The speed reference being used in the case can be reversed, depends on the setting of P5.11 for its function. OFF - not lit - The reference will remain unaffected.
		INPUT 4 Keypad (DDM™) /Remote	ON - lit Yellow - The start/stop controls and the speed reference come from “remote”, which, at default, is the panel plant I/O area. OFF - not lit - The start/stop and speed reference will come from the DDM™ (❾).
		INPUT 5 Ref 1 /Ref 2 only works in Remote, see INPUT 4	ON - lit Yellow - When in remote, the 4-20mA reference is active on Analogue input 2. OFF - not lit - When in remote, the +/- 10V reference is active on Analogue input 1.
		INPUT 6 Trip Reset	ON - lit Yellow - A trip reset pulse is issued. OFF - not lit - No reset pulse is issued Note: This input should be pulsed ON then OFF to perform a reset.

Panel Item No.	Panel Item Area	Specific panel name	Function / Use in the case (@ default)
④	Motor Thermistor (MENU 2)	Motor Thermistor (A Positive Temperature Co-efficient thermistor I/P)	Menu 2, P2.13, P2.14 and P2.15, set up the way in which a PTC can be connected to the ALSPA MV3000. The Motor thermistor simulation potentiometer allows the case user, to simulate a motor overheating and hence show how the ALSPA MV3000 would react.
⑤	Plant Analogue Inputs (MENU 7)	ANALOGUE I/P 1 only works in Remote, see INPUT 4	A -10V to +10V pot has been connected, to simulate a voltage reference to the ALSPA MV3000 . Menu 7 is used to set up the analogue inputs. It is extremely important that the DIP switches are set correctly for this to work.
		ANALOGUE I/P 2 only works in Remote, see INPUT 4	A 4-20mA pot has been connected, to simulate a current reference to the ALSPA MV3000 . Menu 7 is used to set up the analogue inputs. It is extremely important that the DIP switches are set correctly for this to work. A 4-20mA loss switch is also available.
⑥	Analogue DIP Switches	Analogue DIP Switches	Ensure the switches are set as per the graphic on the panel, to set the switches correctly for the default analogue I/O. In reality these DIP switches would be used to configure the analogue I/O for current or voltage operation on the plant.
⑨	Plant Analogue outputs (MENU 7)	ANALOGUE O/P's 1 and 2	2 bipolar +/-10V meters will allow the user to "patch" signals to the outside world, as would be done on plant. Once again it is extremely important that the DIP switches are set correctly for this to work.
⑩	4-20mA loss switch (MENU 5)	4-20mA loss switch	ON - lit Green - The 4-20mA generator in the case is on. OFF - not lit - The 4-20mA generator in the case is off, the drive will trip on reference loss if this reference is selected.

Operating notes:

- Use digital input 4 to switch between keypad (DDM™) and remote (off = keypad).
- To achieve a remote start, press in the stop switch in, then pulse the start switch.
- To achieve a remote stop, open the stop switch.
- The Ref1/Ref2 switch is only active in remote.
- The trip reset (on digital input 6) is active in local or remote modes.

4.3.3 Using the Power Frame Simulation Area (⑦)

The power frame simulation area is split into 4 main areas, they represent areas which exist within a standard ALSPA MV3000 drive. Controls are placed within these areas to allow signals to be adjusted for monitoring and diagnostic demonstrations.

Table 4-2 Details of the Power Frame Simulation Area

Simulator (⑦) Name	Type of Panel Control	Function of Panel Control	Trips, Warnings and Uses
I/P Temperature Feedback INPUT AREA	Potentiometer	Allows the user to vary the simulated I/P bridge heatsink temperature. The value can be seen at P11.08 in °C.	HEALTHY when the pot is at the 12 o'clock position. Increasing the temperature will trip the case on "Over Temperature", reducing the temperature will issue a "Low Temperature" warning, then eventually a trip on "Under Temperature
Precharge Complete INPUT AREA	Red LED	Indicates when The CDC board (❸) has determined that DC Link precharge is complete. Raising the DC link feedback can initiate a simulated precharge.	Raise the DC link to greater than 400Vdc (see DC feedback below) and approximately 1 second later the CDC will determine that precharge is complete. When the DC Link feedback is reduced below 400V, an undervoltage will be detected.
D.B. Hardware Over Temperature DYNAMIC BRAKE AREA	Green Illuminated Switch	Simulates a hardware circuit which monitors the D.B. temperature. See Note 1 below.	HEALTHY when the switch is illuminated. Trips case on "D.B. Hardware O.Temp." when the switch is opened.
D.B. Instantaneous Overcurrent DYNAMIC BRAKE AREA	Green Illuminated Switch	Simulates the trip signal returning from the D.B. IGBT power device.	HEALTHY when the switch is illuminated. Trips on case "DB O-Curr Trip." when the switch is opened.
D.B. Temperature Feedback DYNAMIC BRAKE AREA	Potentiometer	Allows the user to vary the simulated D.B. heatsink temperature. The value can be seen at P11.12 in °C.	HEALTHY when the pot is at the 12 o'clock position. Increasing the temperature will trip the case on "Over Temperature", reducing the temperature will not have any effect, as the pot has not got the range to initiate the UnderTemperature messages.

Simulator (⑦) Name	Type of Panel Control	Function of Panel Control	Trips, Warnings and Uses
DC Link Feedback DC LINK AREA	Potentiometer	Allows the user to vary the simulated DC Link voltage. The value can be seen at P11.03 in Volts. Varying this value will also be seen as a different PWM pulsing on the YELLOW activity LED's, as the drive compensates for the differing DC link levels.	HEALTHY when the pot is at the 12 o'clock position. Increasing the value will not trip the case on overvoltage, as this is left to a hardware detector. If the output is running, a high DC link will be interpreted as voltage across the D.B. resistor and associated "DB resistor" warnings and trips will be seen.
DC Hardware Over Voltage DC LINK AREA	Green Illuminated Switch	Simulates a hardware circuit which monitors the DC link Voltage. See Note 1 below.	HEALTHY when the switch is illuminated. Trips on "DC Over Voltage" when the switch is opened.
O/P Temperature Feedback OUTPUT AREA	Potentiometer	Allows the user to vary the simulated O/P bridge heatsink temperature. The value can be seen at P11.05 in °C.	HEALTHY when the pot is at 12 o'clock. Increasing the temperature will trip the case on "Over Temperature", detected by the software.
O/P Hardware Over Temperature OUTPUT AREA	Green Illuminated Switch	Simulates a hardware circuit which monitors the O/P bridge temperature. See Note 1 below.	HEALTHY when the switch is illuminated. Trips case on " Hardware O.Temp. U" when the switch is opened.
Overcurrent U,V,W OUTPUT AREA	Green Illuminated Switches	Simulates the Overcurrent trip signals returning from the O/P IGBT power devices.	HEALTHY when the switch is illuminated. Trips on "Inst. Overcurrent." when the switches are opened.
Bridge Activity LED's OUTPUT AREA	6 Yellow LED's	There is one LED connected to where there would normally be an IGBT in the drive. the LED's are simulating the power bridge of the drive.	When the O/P bridge is running these LED's light and flicker once per IGBT ON signal. Their flickering alters with speed and DC link volts, showing the interaction of Modulation depth on the PWM signals.

Note 1: For safety, the real ALSPA MV3000 drive monitors certain signals in hardware and software. In the event that the software is not running properly at the time of the problem, then the backup hardware circuit will protect the ALSPA MV3000 against a failure which will damage the product. The case simulates these hardware circuits with switches.

4.3.4 Using the Case Serial Link lead including Connections (⑧)

Introduction

The 7 pin connector in area (⑧) extends the standard CDC board (❸) RS485 and CAN connections to a convenient position on the case. This connector now allows the case to be connected to an RS485 serial link or a CAN bus. Section 3.4 gives details of the connector pin outs and details of the lead provided in the case. The lead allows easy connection to a PC (via an RS232/422 converter) or other serial device. Connection to **ALSTOM** HMI devices, SCADA devices and PLC's is now possible. The case can now be used as a safe and convenient simulated ALSPA MV3000, to develop plant programs on the other devices. Parameters edited in the case to facilitate the completion of this simulated plant, can then be uploaded into the ALSPA Drive Coach or into the DDM™ (via P99.16) and transferred to a fully installed ALSPA MV3000.

1. Connecting to the ALSPA Drive Coach
   The ALSPA drive coach is the PC tool available for the ALSPA MV3000 and allows parameter editing and storage, and also allows graphical access to the drives history record, all of which can be demonstrated using the case.

   To gain communication, set the following values:

   P32.50 = 6 Sets 38400 baud

   P32.51 = 0 Sets an RS485 Address of 0

   P32.52 = 1 Sets GEM80 ESP protocol

   Interactive demonstrations, training or parameter uploading can now be undertaken with the ALSPA Drive Coach. The help files on the ALSPA Drive Coach give all the required detail to successfully run the software tool.

2. Connecting to other Serial Devices
   Once suitable electrical connections have been made (see Section 3.4.4), the CDC board (❸) RS485 port must be configured. This is done in menu 32, starting at P32.50. Parameters for baud rate etc. must be set to gain communication to the other device.
   The user guide control block diagrams (Section 5.3) pictorially show an overview of the parameters and how to access the other menus. The optional software technical manual (T1679) gives a complete and comprehensive parameter listing, this data will give full details for more comprehensive use of this serial port.

3. The CAN connections are currently not in use.

4.4 Demonstrating - a short example

The following is a short example of how the case can be used in its default format. Read Section 4.5 first to gain the necessary skills required to operate the DDM™(❾). The example takes the form of a flow chart for ease.

START HERE

for this example to work the case must be switched on, following the procedure described in Section 4.2, and at default, see Section 5.1.9 to achieve this.

↓

OPENING THE OTHER MENUS

Navigate to P1.31 and edit its value to 2

↓

RE-CONFIGURING ANALOGUE OUTPUT 2 to Show speed reference

An optional part of the demo, only makes the demo more visual.

Navigate to P7.22 and edit its value to 9.00,	This sends the speed reference out
Navigate to P7.24 and edit its value to 1,	Sets the output to bipolar
Navigate to P7.25 and edit its value to 100,	Sets the analogue scaling

↓

4.4.1 Starting from the DDM™(❾)

STARTING FROM THE **DDM™(❾)**

Press the "esc" key twice until Menu 1 is displayed on the DDM™(❾), then press the ▼ arrow on the navigation key to enter Menu 1. The DDM™(❾) will now display P1.00, the speed reference.

1. Press the GREEN Run button on the DDM™(❾).
2. The 6 yellow bridge activity LED's will light (⑦) and digital output 2 (①) will show output running.
3. Edit P1.00 to 100%.
4. Analogue output 2 will read +10, and Analogue output 1 will ramp up to +10 (⑨).
5. The bridge activity LED's will show PWM switching.
6. The "at speed signal" at digital output 3 (①) will go off then come back on.
7. Edit P1.00 to -100%.
8. Analogue output 2 will read -10, and Analogue output 1 will ramp up to -10 (⑨).
9. The "at speed signal" at digital output 3 (①) will go off then come back on.
10. Edit P1.00 to 0%.
11. Analogue output 2 will read 0, and Analogue output 1 will ramp up to 0 (⑨).
12. The "at speed signal" at digital output 3 (①) will go off then come back on.
13. Press the RED Stop button on the keypad (❾).
14. Digital output 2 (①) will show output not running (RED LED)

Parameters in Menu 6 can be adjusted to alter the ramp rates. Analogue output 1 will display the new ramp rates set by the ramp rate parameters, as the speed reference is changed.

↓

CONTINUE - FOR STARTING FROM THE CASE I/O

CONTINUE - FOR STARTING FROM THE CASE I/O

4.4.2 Starting from the Case I/O

STARTING FROM THE CASE I/O

With the keypad still displaying P1.00, the speed reference:

1. Press the YELLOW digital input 4 switch (③), this selects remote control.
2. Pressing the Run button on the DDM™(❾), or attempting to edit P1.00 will result in the keypad reporting that it has not got access to either control or reference.
3. Press the RED stop switch on the I/O panel, connected to digital input 1(③).
4. Pulse the GREEN start button, connected to digital input 2 (③).
5. The 6 yellow bridge activity LED's will light (⑦) and digital output 2 (①) will show output running.
6. Adjust the pot labelled analogue input 1(⑤) ,the +/-10V reference, then leave it still.
7. Analogue output 2 (⑨) will follow the pot, and Analogue output 1 (⑨) will ramp up to it.
8. The bridge activity LED's will show PWM switching (⑦).
9. The at speed signal at digital output 3 (①) will go off then come back on.
10. Press the YELLOW Ref1/Ref2 switch, connected to digital input 5 (③).
11. Analogue input 2 (⑤), the 4-20mA reference, will now be active.
12. Adjust the potentiometer labelled analogue input 2 (⑨), the 4-20mA reference, then leave it still.
13. Analogue output 2 (⑨) will follow the pot, and Analogue output 1 will ramp up to it.
14. The at speed signal at digital output 3 (①) will go off then come back on.
15. Set analogue input 2 (⑤), to 4mA
16. Analogue output 2 (⑨) will read 0, and Analogue output 1 (⑨) will ramp up to 0.
17. The at speed signal at digital output 3 (①) will go off then come back on.
18. Open the RED Stop switch on the I/O panel, connected to digital input 1 (③).
19. Digital output 2 will show output not running (RED LED) (①)

Parameters in Menu 6 can be adjusted to alter the ramp rates. Analogue output 1 will display the new ramp rates set by the ramp rate parameters, as the speed reference is changed.

GETTING HELP WITH DIAGNOSTICS

With the I/O switches left as above, close the stop switch (illuminates RED) and pulse the start, to get the output running:

1. Open the GREEN switch marked 4-20mA loss (⑩).
2. The case will trip (red flashing LED on the DDM™(❾).
3. Press the "?" key on the DDM™(❾). from the menu choose, view trips.
4. Close the 4-20mA loss switch (⑩) so that it illuminates GREEN.
5. Press the "?" key on the keypad, from the menu choose, reset trips, the case will become healthy

GETTING HELP WITH PARAMETERS

With the case healthy, navigate to P5.01. Use the "?" key to get parameter help. Repeatedly pressing the "?" key or pressing ➡ arrow on the navigation key, gives the next piece of HELP.

STOP

4.5 Drive Data Manager™ (⑨) Functions

The Drive Data Manager™ provides Keypad functionality to configure the drive, in addition to providing motor control, diagnostic functions and condition monitoring.

Note: A diagram of the DDM™ is provided for reference inside the rear cover.

4.5.1 Navigation Key

The 4-way Navigation key is used to navigate menus and parameters, and to edit parameter values. Operation of the Navigation key is shown inside the rear cover.

4.5.2 Navigating to Menus and Parameters

Figure 4-1 shows how to navigate the menus and parameters to find any parameter. Menu 1 and its parameters are illustrated as an example, other menus are treated in exactly the same way. To access menus other than Menu 1, edit parameter P1.31 as shown in Section 5.1.7.

The start-up screen which is displayed when the case is first switched on, with the DDM™ connected, is labelled below, this shows the default value for P1.00.

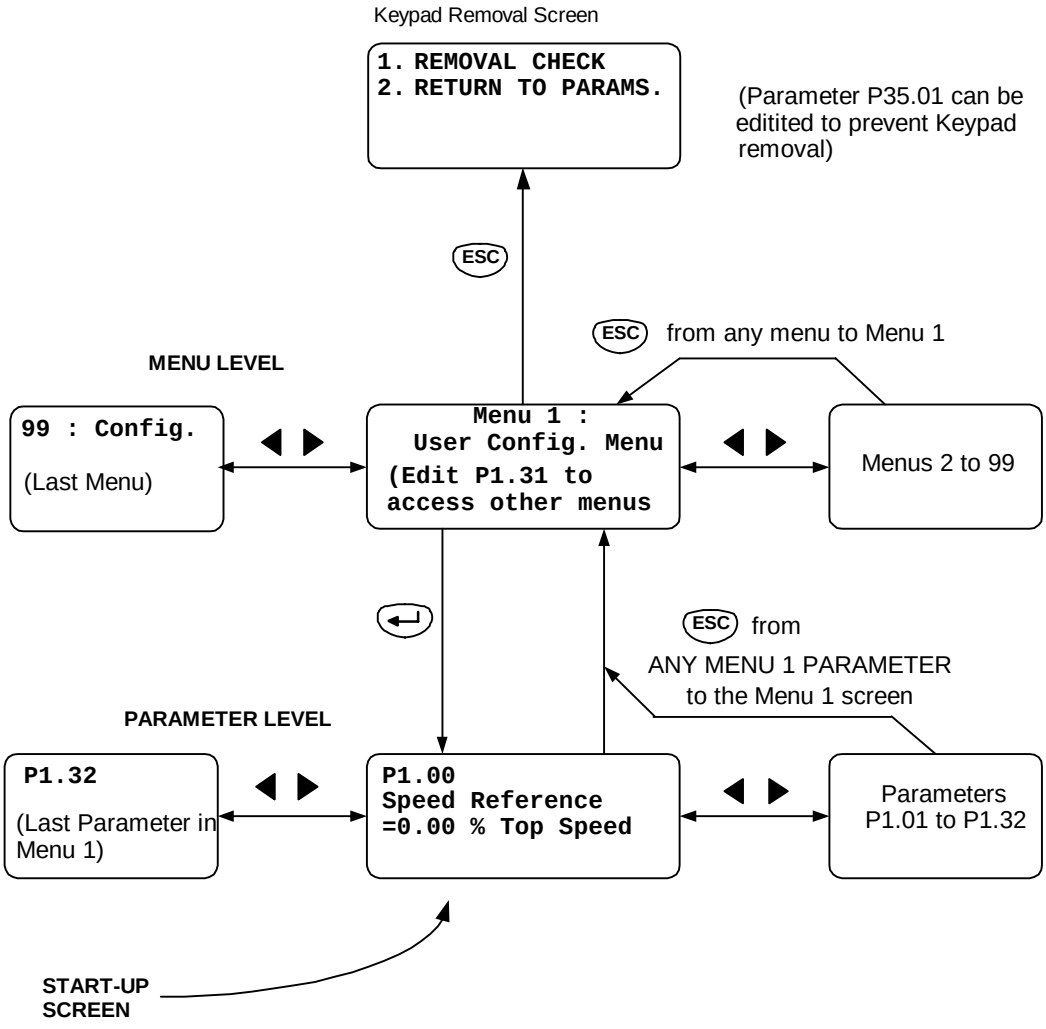


Figure 4-1 Navigating menus and parameters

4.5.3 SHORTCUT Method of Entering a Parameter Number

If the parameter number is known, it can be entered directly using a shortcut method. From the parameter or menu level, proceed as follows :

For example, the key Sequence to shortcut to P1.00, the Speed Reference:

P1.00 <Enter>

4.5.4 Editing Parameters

Two types of parameter may be edited:

NUMERICAL parameters – to change the value

LIST parameters – to choose from a list

NUMERICAL parameter

As an example of editing numerical parameters, Figure 4-2 shows how to edit the value of the Motor Base Frequency parameter P2.00.

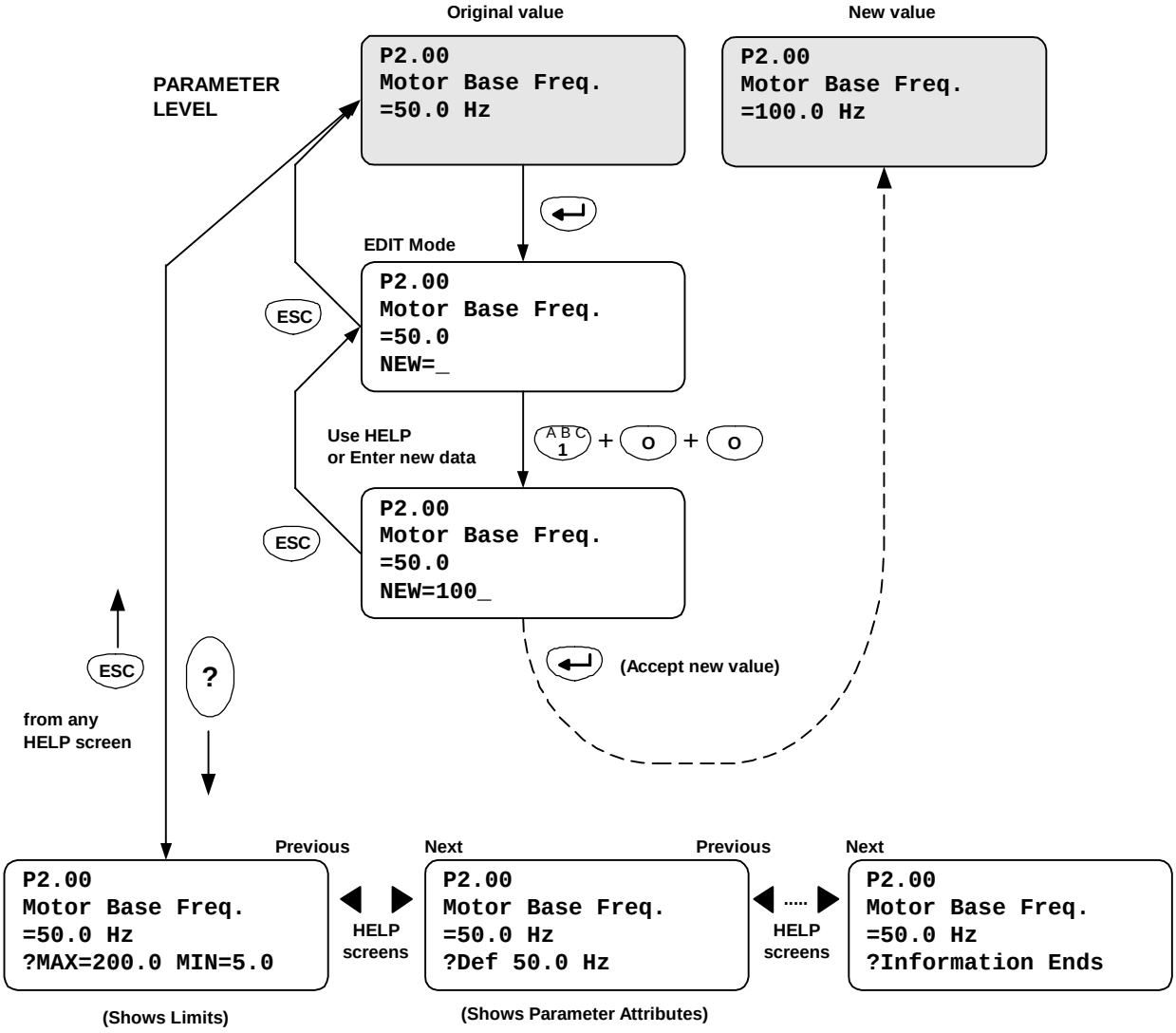


Figure 4-2 Editing a numerical parameter

LIST parameter

This type of parameter contains a list of choices or items etc. Figure 4-3 shows how to select from a list parameter, using the Speed Reference 1 Source parameter P5.01 as an example.

The options in a list parameter can either be determined by consulting the optional software manual (T1679) or by simply pressing the "?" key, this key gives context sensitive help when required, here parameter help is given. The diagram shows how the help key can be used to determine a required selection.

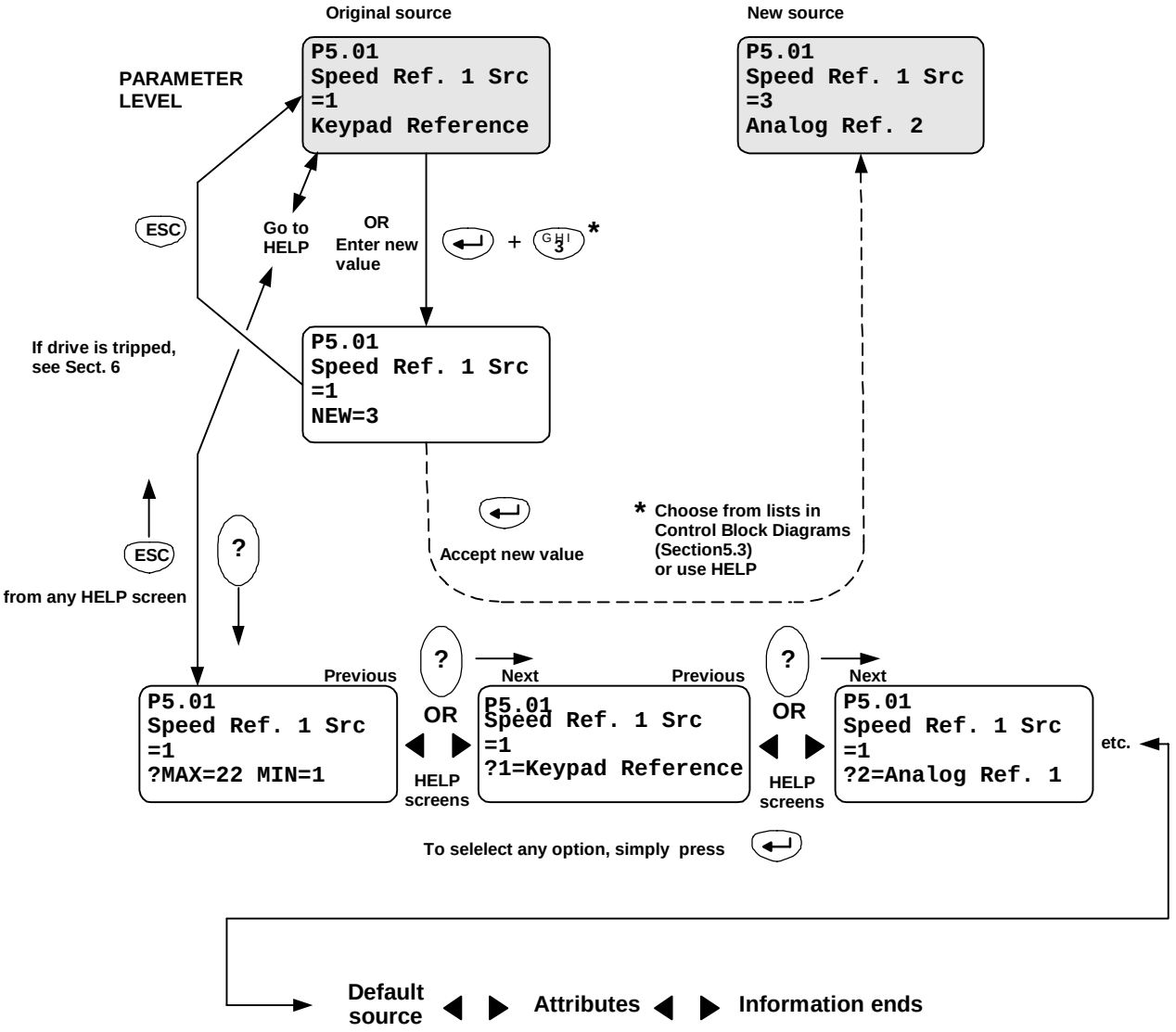


Figure 4-3 Editing a "List" parameter

4.5.5 Using the DDM™ HELP (?) Key

The help key can provide diagnostic help or parameter help, this help function is context sensitive. See Section 6 for a detailed use of the "?" key during diagnostics and Section 4.5.4, List parameters, for an example of how to get Parameter help.

4.5.6 DDM™ (keypad) Removal Checks

Note: To allow the drive to make the necessary safety checks, this removal procedure should always be followed. A trip may result if this procedure is not followed.

The drive checks if DDM™ removal is allowed as the DDM™ may have Start/Stop control, or the DDM™ Speed Reference may be active.

To remove the DDM™ , continue as shown in Table 4-3.

Table 4-3 How to remove the DDM™

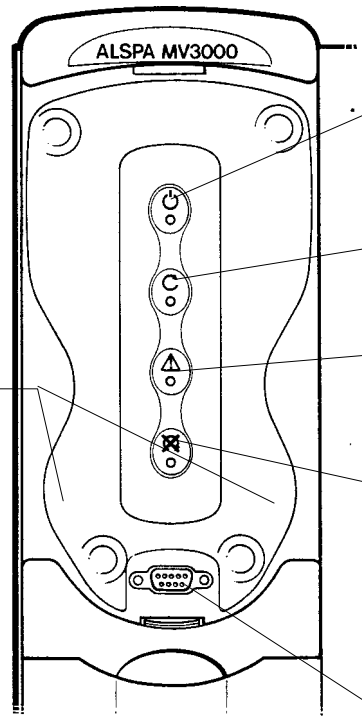
	Do What?	How?
1	Ensure the Keypad (DDM™) is neither in control of the Start/Stop nor the Keypad Speed Reference is active	AT DEFAULT: Close DIGIN4, this will select Remote. ELSE: Gain the necessary authorisation before continuing. a) Make P4.09 = 1, to set CF116 ON, this removes the Start/Stop Control from the Keypad (DDM™). b) The Keypad (DDM™) must <u>not</u> be either the <u>active</u> reference source or the <u>backup</u> reference source. The reference sources are held in P5.01 to P5.05 and are made active by CF4 to CF7 (P5.07 to P5.10) respectively. The backup reference is P5.06.
2	Access the Keypad removal screen 1. REMOVAL CHECK 2. RETURN TO PARAMS.	Press the “esc” key repeatedly.
3	Select “REMOVAL CHECK”	Press the “1” key on the Keypad (DDM™). The drive checks to see if the Keypad is allowed to be removed. As well as the above control and reference checks, P35.01 (Allow Keypad Removal) is also checked.
4	Remove Keypad if the screen allows: ****KEYPAD READY**** ****FOR REMOVAL****	A message may be flashed disallowing removal because the Keypad is either still in control, still has active/backup reference (see step 1 above) or if it is simply disallowed (see step 3 above).

Note: If the DDM™ is neither in control or is a valid reference choice, the DDM™ can be removed without a trip and without invoking the above procedure, HOWEVER it is useful to make a habit of the above removal procedure so that the ALSPA MV3000 is able to make the necessary checks.

4.6 DDM™ Harbour (❽)

4.6.1 Harbour LED Indicators

If the DDM™ is <u>not</u> fitted, or the DDM™ is fitted via its lead and is being hand held, four LED's on the DDM™ Harbour indicate drive status as shown in Figure 4-4 below. These LED's are duplicated on the DDM™.



HEALTHY (STANDBY) (green)
Mains power is applied to the drive and there are no faults or warnings.

RUNNING (green)
The drive is producing an output

WARNING (amber)
A warning condition exists, not sufficient to cause the drive to trip

TRIPPED (red)
A fault condition has caused the drive to trip. Refer to Section 6.6, Otherwise press the "?" key for on-line parameter HELP.

RS232 Serial link Connector
The DDM™ is connected here, however the port can be used to connect to other serial devices. Menu 32 configures the port and the keypad auto-connects if the port is used for other items.

Depressions used when removing the keypad from the harbour.

Figure 4-4 DDM™ Harbour and indicators

4.6.2 Removing the DDM™ from the Harbour, and re-fitting.

The DDM™ (❾) is removed by first carrying out the correct removal checks, which is detailed in Section 4.5.6, then, grasp the DDM™ (❾) at the bottom and press fingers and thumbs into the depressions in the harbour (❽) moulding (as draw above in Figure 4-4), the DDM™ (❾) will snap out.

Re-fitting the DDM™(❾) is described on the data sheet (T1915) which is supplied as an accessory and is stored in the case document wallet.

4.7 Limitations of this Demonstration Case

As the output bridge of the ALSPA MV3000 is simulated here by 6 LED's, and since there is not a motor connected to the case, some of the monitoring and feedback parameters in the menu structure will give a false reading. The parameters associated with current and power are the ones which are effected.

Setting Vector control in P99.01 may also give a variety of faults for the same reasons.

5. Menus and Parameters

5.1 MV3000 Menus and Parameters Overview

5.1.1 Introduction

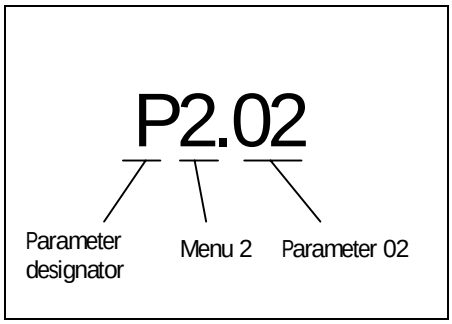
The purpose of this section is to introduce the user to the software environment of the ALSPA MV3000. This will allow more effective demonstrations to be given and also allow the case to be used to develop and practise software writing for the drive.

5.1.2 What is a Parameter?

The ALSPA MV3000 software uses system constants, scaling factors and other data, collectively referred to as PARAMETERS, which are arranged into MENUS for ease of use. Menus group parameters by like function e.g. Menu 6 contains Ramp Settings. The complete menu listing is shown in Table 5-1. Some Parameters are duplicated into more than one menu to make them easier to locate.

Every parameter has a Parameter Number , which includes the menu in which it is located. See opposite for an example:

The parameters can be accessed by navigating or shortcutting to them. Refer to section 4 for how to use the DDM™.



5.1.3 Parameter Attributes

All parameters have attributes which specify how they may be accessed. Attributes are determined by the parameter function, e.g. security or user level password requirement, or the type of parameter, e.g. a List. The DDM™ will display these attributes when the "?" is pressed. The types of attribute are described below.

Attribute	Security /User Level /Type
E	Engineer accessible - only accessible if the engineering password has been entered into P99.06 or P1.32, see Section 5.1.4.
L	List parameter, value selected from a pre-defined list
N	(eNter) has to be pressed to update
O	Operator accessible - only accessible if the operator password has been entered in P99.06 or P1.32, see Section 5.1.4.
R	Read only (monitoring parameters)
S	Stop to edit, the output must be stopped to allow editing

5.1.4 Parameter Passwords

A simple system of passwords allows control of access to parameters, the method of entry is described below. Two levels of access are provided:

Access Level	Default Password	Default Status
Operator	0	Unlocked
Engineer	0	Unlocked

Using the passwords

1. The Engineer's password is stored in P99.08 (a 4 digit code).
2. The Operator's password is stored in P99.07(a 4 digit code).
3. Enter the "key" code into P99.06 (or P1.32, its duplicate). If the key matches either the Engineer's or the Operator's code, then that relevant level is unlocked, and parameters with those attributes can be edited.
4. Once unlocked, new passwords can be edited into P99.08 or P99.07.

5.1.5 A Complete Menu Listing

Table 5-1 Complete Menu listing

Menu	Description	Menu	Description
1	User configured menu	27	History log playback settings
2	Basic motor settings	28	Auto-reset settings
3	Frequency control settings	29	Speed and torque monitor settings
4	Start and stop control	30	Logic block settings
5	Speed reference settings	31	Status flag generator settings
6	Ramp settings	32	Serial links settings
7	Plant I/O settings	33	Control flag 0 to 99 source settings
8	Torque limit settings	34	Control flag 100 to 126 source settings
9	Basic drive monitoring	35	Miscellaneous features settings
10	Trips and warnings	36	Position controller settings (encoder only)
11	Advanced drive monitoring	37	Position reference settings (encoder only)
12	Motor advanced settings (vector only)	38	Position controller monitor (encoder only)
13	Speed feedback settings (vector only)	39	User configurable menu (Menu 1) settings
14	Speed loop settings (vector only)	40	Summing nodes settings
15	Torque reference settings (vector only)	41	Programmable status word settings
16	PID controller settings	42	Pointer source settings
17	Reference sequencer settings	43	Load fault detection window settings
18	Motorised potentiometer settings	44	Reference shaper settings
19	Trim reference settings	80	FIP - Configuration and status data
20	High speed digital I/O settings	83	FIP - Fast produced VCOMs
21	Fixed reference settings	84	FIP - Fast consumed VCOMs
22	Skip speed settings	85	FIP - Slow VCOMs and FIP refs.
23	Dynamic brake control settings	89	FIP - Data spy module
24	Speed trim settings	98	Menu enable selection settings
25	Inertia compensation settings	99	Configuration settings
26	History log settings		

5.1.6 User Configurable Menu 1

This is a special menu containing a selection of 30 parameters copied from the drive's complete parameter list. Menu 1 can be configured via Menu 39 to hold the most useful parameters in any application. Table 5-2 shows the parameters copied into Menu 1 by **ALSTOM**. The table also shows the identity of the source parameters.

Table 5-2 Menu 1 – User Configurable Menu

Parameter No.	Source Parameter Configured by Menu 39	Function	Parameter No.	Source Parameter Configured by Menu 39	Function
P1.00	P9.00	Speed Reference	P1.17	P5.17	Minimum Speed Fwd
P1.01	P9.01	Speed Feedback	P1.18	P5.18	Minimum Speed Rev
P1.02	P9.05	Motor Current	P1.19	P3.00	Fluxing Control
P1.03	P9.09	Frequency Feedback	P1.20	P3.01	Fixed Volts Boost
P1.04	P9.07	Motor Volts	P1.21	P3.31	Economy Factor
P1.05	P9.08	Motor Power	P1.22	P6.00	Accel. Rate Fwd.
P1.06	P10.00	Warning No. 1	P1.23	P6.02	Decel. Rate Fwd.
P1.07	P10.10	Trip No. 1	P1.24	P4.00	Start Mode
P1.08	P10.11	Trip No. 2	P1.25	P4.07	Normal Stop Mode
P1.09	P99.10	User Text Language	P1.26	P3.05	Fixed Current Limit
P1.10	P2.01	Motor Base Voltage	P1.27	P99.05	Drive Nominal Current
P1.11	P2.00	Motor Base Frequency	P1.28	P4.12	Motor Regen. kW Limit
P1.12	P2.02	Motor Full Load Current	P1.29	P99.02	Overload Duty
P1.13	P2.04	Motor Nominal Speed	P1.30	P99.00	Number of Deltas
P1.14	P2.05	Motor Full Load Power Factor	The following parameters are **ALWAYS** present in Menu 1		
P1.15	P5.15	Maximum Speed Fwd	P1.31	Advanced Menus,	initially only Menu 1 is open, see Section 5.1.7.
P1.16	P5.16	Maximum Speed Rev	P1.32	Security Code	(as parameter P99.06), allows the user to "lock" the access to the menus

5.1.7 Access to Other Menus (P1.31)

As shipped, only Menu 1 is accessible. Access to other menus is controlled by the value entered into parameter P1.31, which determines the menus that can be displayed by the DDM™. Three levels of access are provided:

P1.31 value	Access level
0	Show Menu 1 only (by default, only Menu 1 is shown)
1	As specified by Menu 98 (can choose which individual menus are open by setting parameters in menu 98)
2	All menus open

Note: P1.31 is controlled by an Engineering password. Refer to Section 5.1.4.

5.1.8 Reviewing Parameter Edits Made

There are 2 ways of reviewing the edits made to the CDC board (❸) parameters with the items supplied with the case. One method is to use the ALSPA Drive Coach PC tool, the other is to view the edits via the DDM™.

To use the DDM™ proceed as follows:

1. Set parameter P1.31 = 2.
2. Navigate to P35.03 and edit its value to 1, to set up a review of edits.
3. Press ▶| to scroll through the current user edits; note these values.
4. When P35.03 re-appears all user edits have been displayed. Change P35.03 back to 0.

To use the ALSPA Drive Coach

1. Refer to section 4.3.4 for details of how to connect the case to a PC
2. Refer to the Coach help files to upload a “User Edits only” parameter listing.

5.1.9 Returning to Factory Default Settings

CAUTION
When the product is reset to factory default, all customised parameter settings will be lost. Record customised parameter settings before the drive is reset. They can be re-entered when required.

If incorrect data is entered during programming, the factory default settings can be regained using the following procedure. The procedure, described is in 2 parts, record the current settings for reference, then default the parameters:

1. Carry out a review of parameters if required, see section 5.1.8
2. Navigate to P99.06 and enter the password for engineer access (see Section 5.1.4)
3. Set P99.17 = 1 and press
4. The DDM™ communications will re-initiate, then display P1.00.
5. The drive will now be at default settings.

5.1.10 Default Configuration, as shipped by **ALSTOM**

When the MV3000 (hence the case) leaves the factory, all the parameters are pre-loaded with default values which allow it to drive a motor safely and in a sensible manner. Table 5-3 will provide help in understanding the default settings for Start/Stop control and Speed reference selection. The table should be read in conjunction with sheet 3 of the control block diagrams (Section 5.3) and the explanation of Control Flags (CF) and Status Flags (SF) in Section 5.2.1. Figure 5-1 shows the I/O connections to the MV3000, provided solely for reference.

Table 5-3 Start/Stop and reference selecting at default

	LOCAL CONTROL			
WHEN	**DIGIN4** (Local/Remote)			
IS	OPEN			
IT SELECTS	Keypad (DDM™) Control **&** Reference Selection #1			
BECAUSE	CF116 is set OFF, as it is connected to **DIGIN4** (P4.09 = 1.004)		CF4 is set ON, as it is connected to the INV of **DIGIN4** (P5.07 = -1.004)	
WHICH MEANS	Keypad (DDM™) has Start/Stop Control		The reference chosen by P5.01 is active, the default for which is Keypad (DDM™). (P5.01 = 1)	
NOTE	All other Start/Stops are inactive		Lowest Control Flag reference selector takes priority, thus when CF4 is ON the others (CF5, CF6, CF7) are ignored.	
	REMOTE CONTROL			
WHEN	**DIGIN4** (Local/Remote)		**DIGIN5** (Remote Reference 1/2 selection)	
IS	CLOSED		OPEN	CLOSED
IT SELECTS	Remote Control **&** The next priority reference selection becomes active		Reference selection #2 (if **DIGIN4** closed)	Reference selection #3 (if **DIGIN4** closed)
BECAUSE	CF116 is set ON, as it is connected to **DIGIN4** (P4.09 = 1.004)	CF4 is now OFF (INV **DIGIN 4**), thus CF5,6,7 become active (P5.08 to P5.10)	CF5 is ON, as it is connected to the INV of **DIGIN5** (P5.08 = -1.005)	CF5 is OFF, and CF6 is ON as it is connected directly to **DIGIN5** (P5.09 = 1.005)
WHICH MEANS	Remote Start/Stop connections become active (**DIGIN1** and **DIGIN 2** at default)	**DIGIN5** becomes able to select between reference selections #2 and #3	The reference chosen by P5.02 is active, the default for which is Analogue I/P 1 (P5.02 = 2)	The reference chosen by P5.03 is active, the default for which is Analogue I/P 2 (P5.03 = 3)
NOTE	Keypad (DDM™) Start/Stops are inactive	Lowest control flag still has priority, thus CF5 has priority over CF6	Menu 7 and the DIP switches configure analogue inputs	Menu 7 and the DIP switches configure analogue inputs

Programming the case adjusts these defaults. If for any reason programming the case results in an unworkable system, it is possible to restore the default values – see Section 5.1.9 on how to restore defaults.

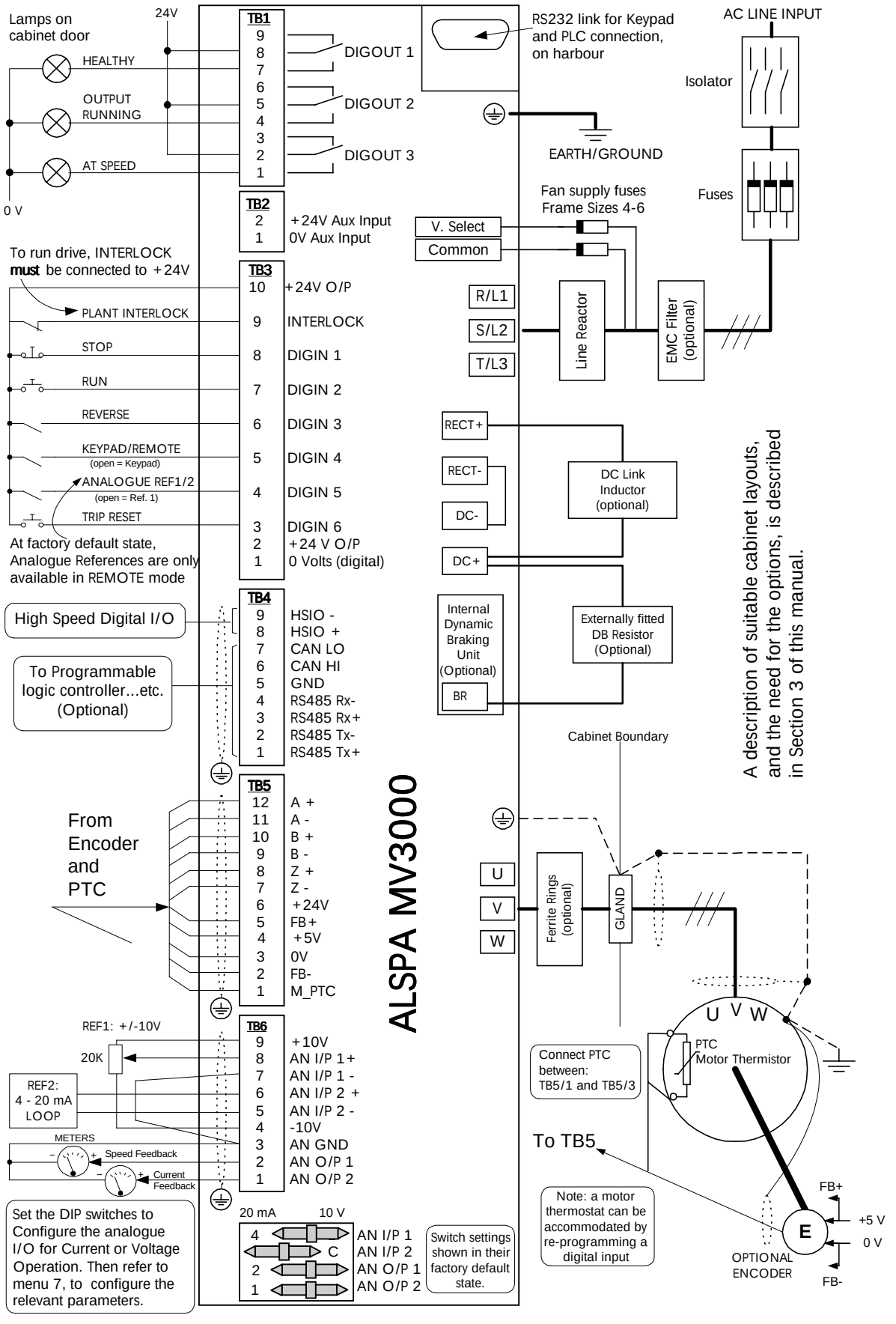


Figure 5-1 ALSPA MV3000 Default Wiring Diagram, given here for reference

5.2 Practise Application Programming

The case can be used to develop application programs or simply to practise programming in the ALSPA MV3000 environment. Programs developed can be transferred to a real working drive either via the ALSPA Drive Coach or via the DDM™ (using P99.16) and transferred to a fully installed ALSPA MV3000.

The key to understanding the drive is to refer to Control block diagrams. These diagrams have been created to show the ALSPA MV3000 software as a picture. Software flow, special functions and parameter numbers can all be identified from the diagram. The diagrams are stored in Section 5.3.

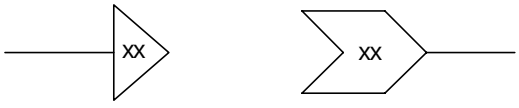
The ALSPA MV3000 software contains a large number of pre-defined special functions and a range of freely connectable logic, which, when combined, will allow the user to solve many application problems and generally enhance the final application solution.

Special functions such as speed and torque monitors can be used to generate conditional outputs to allow hoist brake control or duty standby pump control. A full position controller is included and a function called Load Fault Detection, which will allow a the drive to "condition monitor" the application so that preventive maintenance can take place.

The following sections provide hints about how to achieve these application solutions. Detailed parameter descriptions are contained within the optional Software Technical Manual T1679.

5.2.1 Control Flags and Status Flags

The ALSPA MV3000 system employs two kinds of flags. These flags either allow the user to CONTROL a function (Control Flag), e.g. Enable Jogging, or the drive can report the STATUS of a function (Status Flag), e.g. Overspeed. In this manual these flags are shown as below, where xx represents the flag number.



Status Flag (SF) Control Flag (CF)

The flags can be combined together to form elegant application solutions or simply passed to digital outputs or serial links to gain status information about the drive's condition. The most used flags are connected up already by the factory default conditions. The default conditions are clearly marked on the user block diagrams.

The Control flags have parameters which allow the user to "patch" them to other parts of the drive system. The control flag parameters appear in two logical places:

1. In the menus local to the function associated with the flag, e.g. the START flag is available in Menu 4 ,Starting and Stopping, and is parameter P4.04.

2. In the control flag menus, Menu 33 and 34, where all the flags are grouped together for easy location, e.g. the Start flag (CF1) is also P33.01, see the "rules" below.

The Status flags have no parameters associated with them, as they are simply possible connection sources for the Control flags, digital outputs and serial links etc.

5.2.2 Rules for Using the Flags

1. Refer to the control block diagram to determine the Control flag required. The diagram actually has the "Local" menu parameter number printed next to it.
2. Alternatively determine the Control flag parameter number thus:

   P33.xx, where xx is the control flag number
   CF1 =P33.01
   CF9 =P33.09 etc.
   CF116 = P34.16 (the hundreds are in Menu 34)

3. Edit a value into the Control Flag parameter, this value will determine what the flag is connected to. Table 5-4 summarises the possible choices:

Table 5-4 Control flag and digital I/O connections

Value	Control Flag (CF) or Digital Output is connected to:
0.000 or 0	OFF
0.001 or 1	ON
1.001 to 1.006	DIGITAL INPUT 1 to 6
2.000 to 2.110	STATUS FLAGS 0 to 110
3.000 to 3.015, 3.100 to 3.115	RS485 CONTROL WORDS 0 and 1, BITS 0 to 15
4.000 to 4.015, 4.100 to 4.115	RS232 CONTROL WORDS 0 and 1, BITS 0 to 15
5.100 to 5.115, 5.200 to 5.215	FIP CONTROL WORDS 1 and 2, BITS 0 to 15

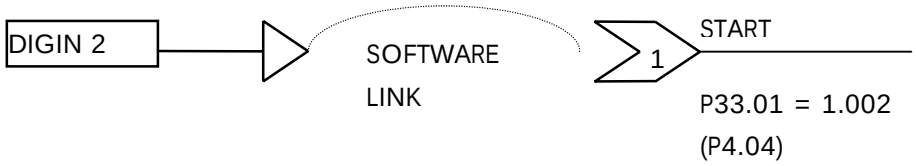
Note: Any of the signals above can be inverted without the need to "waste" logic gates by simply preceding the value with a "-" sign. Thus if:

if P33.01 = 1.002, then Control flag 1 will be connected to digital input 2

or if P33.01 = -1.002, then Control flag 1 will be connected to the INV of input 2.

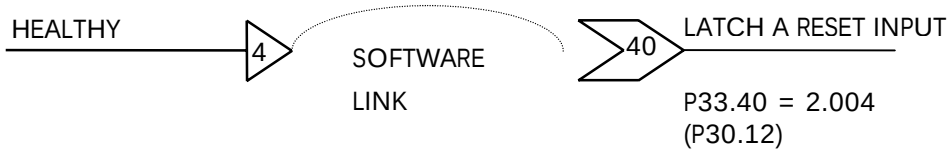
Example 1: How the Start Flag is connected

At default the drive has the Start flag connected to digital input 2, this example shows the software connections and the required edits, by way of a Control flag programming example:



Example 2: How to connect Control and Status flags together

This example shows a simple connection which might be made to the logic blocks

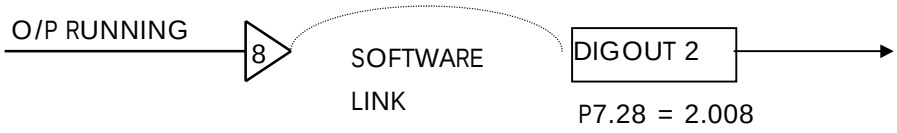


5.2.3 Programming Digital I/O

Sheet 2 of the control block diagrams shows the parameters associated with the digital I/O.

The digital I/O is programmed and used in exactly the same way as the Control and Status flags. The digital inputs are used like Status flags, and appear in the list of possible values which can be edited into the Control flag parameters (see Section 5.2.2).
The Digital outputs have parameters and are programmed like Control Flags, having access to all of the same possible connections (see Section 5.2.2). The Control block diagram plant I/O sheet (sheet 2) shows the plant I/O.

Example 1: How the "O/P Running" output is connected



5.2.4 Programming Analogue I/O

Sheet 2 of the control block diagrams shows the parameters associated with the analogue I/O.

Analogue Inputs

The 2 inputs can be put into either current or voltage modes. The mode is chosen by combining the mode parameter with the analogue DIP switches. If a voltage mode is chosen, the relevant switch must be in its voltage position. The analogue input then appears as an option in all of the reference parameters lists. Alternatively, the analogue value can be picked as a source for the comparator logic (sheet 8) or a pointer (sheet 10).

Scaling and Offsets. If a minimum speed is programmed, and the full range of the analogue input is required to span minimum speed to maximum speed, then the scaling and offset values must be set, example as follows:

P5.15 = Maximum speed forward = 1500rpm
P5.17 = Minimum speed forward = 150rpm

Then set:

$$P7.01 = \frac{150}{1500} \times 100 = 10\%\ \text{offset}, \qquad P7.02 = \frac{1500 - 150}{1500} = 0.9\ \text{gain}$$

Analogue Outputs

The 2 outputs can be put into either current or voltage modes. The mode is chosen by combining the mode parameter with the analogue DIP switches. If a voltage mode is chosen, the relevant switch must be in its voltage position. Any parameter within the ALSPA MV3000 software can then be output via an analogue output and either displayed on a meter or passed to another case or drive.

Scaling and Polarity. Once a parameter has been chosen for output, the relevant scaling and polarity must be applied so that a sensible value appears. The scaling parameter will automatically acquire the units of the parameter being output, then simply edit the scaling to be the value that is required to represent full scale deflection of the analogue output, for example:

To "send" DC link volts to an analogue output, then:

P7.17 = 11.03 (Parameter P11.03, DC link volts)

P7.19 = 0 (monopolar)

P7.20 = 560 (at 560Vdc the analogue output will show full scale)

5.3 Using the Control Block Diagrams

The Control Block Diagrams for the ALSPA MV3000 drive are shown on the following pages. These diagrams graphically represent most of the drive's parameters. They are designed to show the inter-relationship of the drive functions and features and form a set of sheets which will allow the user to completely design customised application solutions and to understand the ALSPA MV3000 software.

Functions within the drive either output a value, which can be the source for an analogue output or for another function, or they output status information (Status Flags), e.g. Overspeed. The functions also accept control inputs (Control Flags), e.g. Enable Jog, or freeze ramps etc. The diagrams clearly show this information by easily recognised symbols. The symbols are shown in a key which is featured on each of the diagrams.
Sheet 1 is an overview of the menus and the other nine sheets, and can be used as a reference sheet.

Figure 5-2 shows how to use the control block diagrams to assist in configuring the drive for an application.

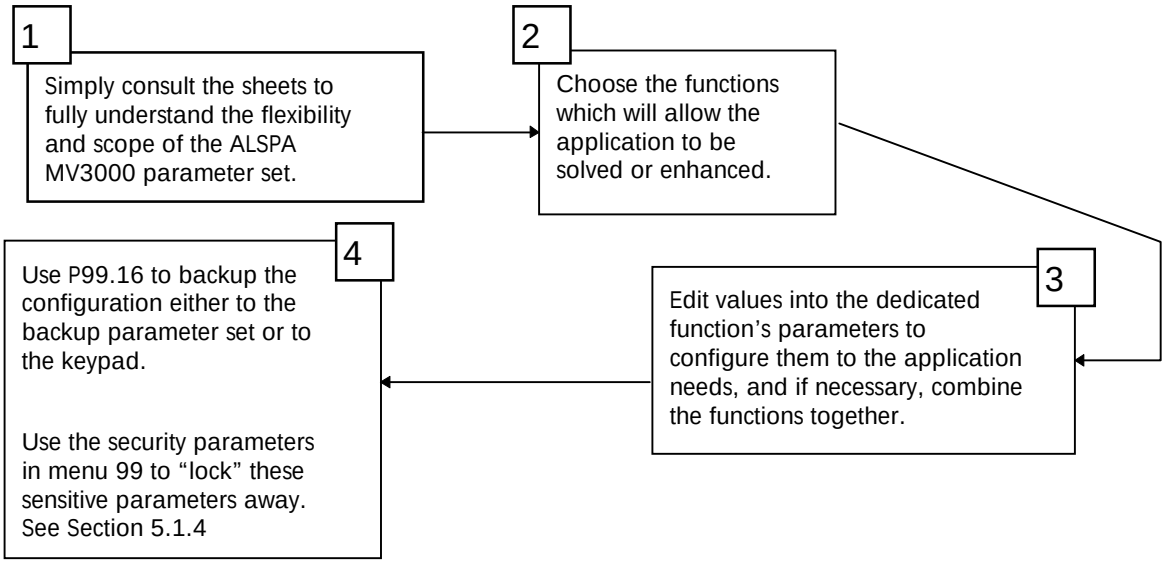
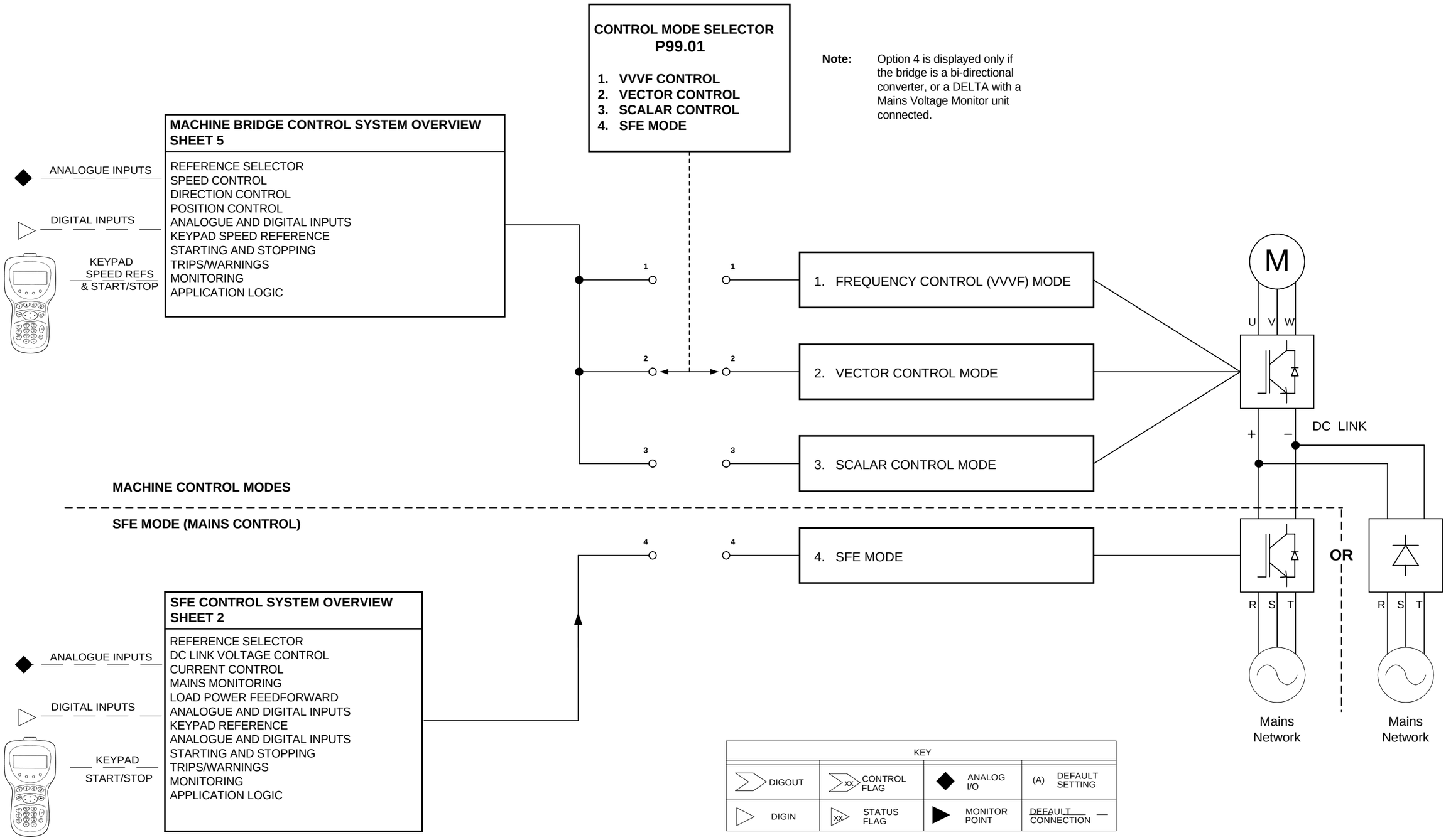

1
Simply consult the sheets to fully understand the flexibility and scope of the ALSPA MV3000 parameter set.
2
Choose the functions which will allow the application to be solved or enhanced.
3
Edit values into the dedicated function's parameters to configure them to the application needs, and if necessary, combine the functions together.
4
Use P99.16 to backup the configuration either to the backup parameter set or to the keypad.
Use the security parameters in menu 99 to "lock" these sensitive parameters away. See Section 5.1.4

Figure 5-2 Use of control block diagrams

Control System Overview



Sheet 1

SFE Control System Overview

INTERLOCK — PLANT INTERLOCK (IF THIS INPUT IS OPEN, THE SFE WILL TRIP)

FOR PLANT I/O SEE MENU 7, SHEET 6

- SELECT 110% or 150% OVERLOAD DUTY P99.02 (P1.29)
- SELECT STANDARD OR ALTERNATE AC VOLTAGE GRADE P99.11 (P1.28)

THESE PARAMETERS MAY BE ENTERED BY KEYPAD. THIS DOES NOT MAKE THE KEYPAD A "REFERENCE SOURCE", SO KEYPAD REMOVAL WILL BE ALLOWED.

ANALOG REF 1 — +/- 10V @ DEFAULT

ANALOG REF 2 — 4 - 20mA @ DEFAULT

EDIT PARAMETERS

KEYPAD START/STOP

DIGIN 1 STOP

DIGIN 2 START

DIGIN 4 KEYPAD/REMOTE

DIGIN 3 RUN PERMIT

DIGIN 6 TRIP RESET

SFE VECTOR CONTROL, PART 1 — SHEET 3

- REFERENCE SOURCE SELECTION — MENU 53
- DC LINK VOLTAGE CONTROL — MENUS 50, 52
- REACTIVE CURRENT REFERENCE — MENU 52
- LOAD POWER FEEDFORWARD — MENU 52

VECTOR CONTROL, PART 2 — SHEET 4

- CURRENT CONTROL — MENU 52
- MAINS MONITORING — MENU 52

STARTING AND STOPPING — SHEET 7

- REMOTE START/STOP FLAGS — MENU 50
- NORMAL STOP (0)
- START (1)
- KEYPAD/REMOTE (116)
- START AND STOP SFE

TRIPS/WARNINGS/DIAGNOSTIC MONITORS — SHEET 11

- TRIP MONITORING SYSTEM — 10 PRESENT TRIPS. 10 PRESENT WARNINGS. 10 TRIP HISTORY STORAGE. USER CONFIGURABLE TRIPS. — MENU 10
- HISTORY RECORDING — 10 CHANNELS MONITOR ANY SFE PARAMETER; TRIGGER SET-UP PRE AND POST TRIG MANUAL TRIGGER — MENUS 26 and 27
- MONITORING — EXTENSIVE SYSTEM MONITORS TO AID VIEWING AND DIAGNOSTICS — MENU 11 & 51
- AUTO-RESETTING/STARTING — CONFIGURE THE SFE TO AUTO-RESET/RESTART AFTER A TRIP; CUSTOMER SELECTABLE RESET ENABLES; NUMBER OF RESETS AND TIMINGS OF RESETS — MENU 28

TRIP (9) / TRIP RESET; TRIPPED (5)

USING "NOT" TRIPPED ENSURES THAT WARNINGS DO NOT AFFECT THE HEALTHY OUTPUT

OTHER USEFUL MENUS

- MENU 99 SECURITY CODES, PARAMETER BACKUP AND SYSTEM CONFIGURATIONS
- MENU 35 KEYPAD REMOVAL, PARAMETER PRINTING AND PARAMETER "LOCKING"

APPLICATION LOGIC, SPECIAL MONITORING FUNCTIONS — SHEET 12

- LOGIC GATES COMPARATORS DELAYS — MENU 30
- STATUS FLAG BINARY GENERATOR — MENU 31

SUMMING NODES, SWITCHES AND POINTERS — SHEET 14

- MENU 40 PROGRAMMABLE SUMMING NODES, ALLOWING SCALING AND SUMMATION OF ANY SFE PARAMETER.
- MENU 42 POINTERS. THESE POINTERS ARE ASSOCIATED WITH MOST OF THE SFE's REFERENCEC CHOICES, AND ALLOWS THE USER TO CHOOSE ANY SFE PARAMETER FOR THE REQUIRED USE.

SFE MONITORING MENUS — MENUS 11, 45 and 51

- MENU 45 SFE TEMPERATURES
- MENU 11 MONITORING OF SFE VARIABLES, INCLUDING TEMPERATURES, CONTROL AND STATUS FLAGS HOURS RUN, DIGITAL I/O STATES, ANALOGUE INPUT AND OUTPUT VALUES AND OTHERS.
- MENU 51 SFE VOLTS, CURRENTS, POWER FEEDBACKS

KEY

DIGOUT	CONTROL FLAG	ANALOG I/O	(A) DEFAULT SETTING
DIGIN	STATUS FLAG	MONITOR POINT	DEFAULT CONNECTION

MAINS BRIDGE

- PRECHARGE CIRCUIT AND MAINS MONITOR
- BI-DIRECTIONAL CONVERTER
- HARDWARE BRIDGE INTERLOCK
- AuxR, AuxS, AuxT
- PRECHARGE COMPLETE (47)
- TB7
- V dc AT REF (100)
- DC LINK (+ / −)
- R/U, S/V, T/W
- LCN
- MAINS
- OUTPUT ENABLE/RUN (25)
- SFE RUNNING (8)

SHEET 11 — OPTIONAL DYNAMIC BRAKE — MENU 23

P11.03, P51.00 — DC LINK VOLTS

ANCILLARY COMPONENTS

HEALTHY (MENU 7) — DIGOUT 1

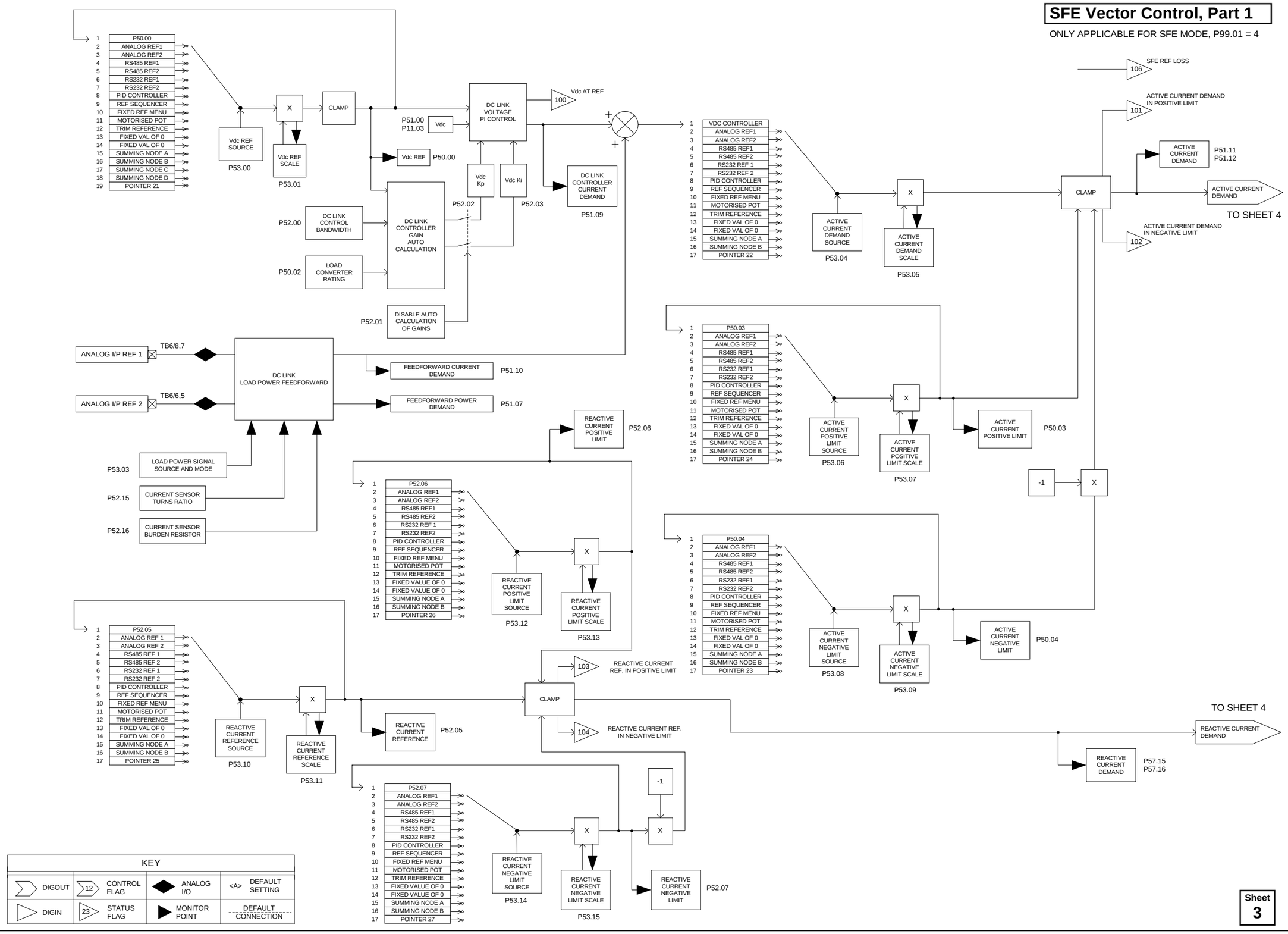
SFE RUNNING (MENU 7) — DIGOUT 2

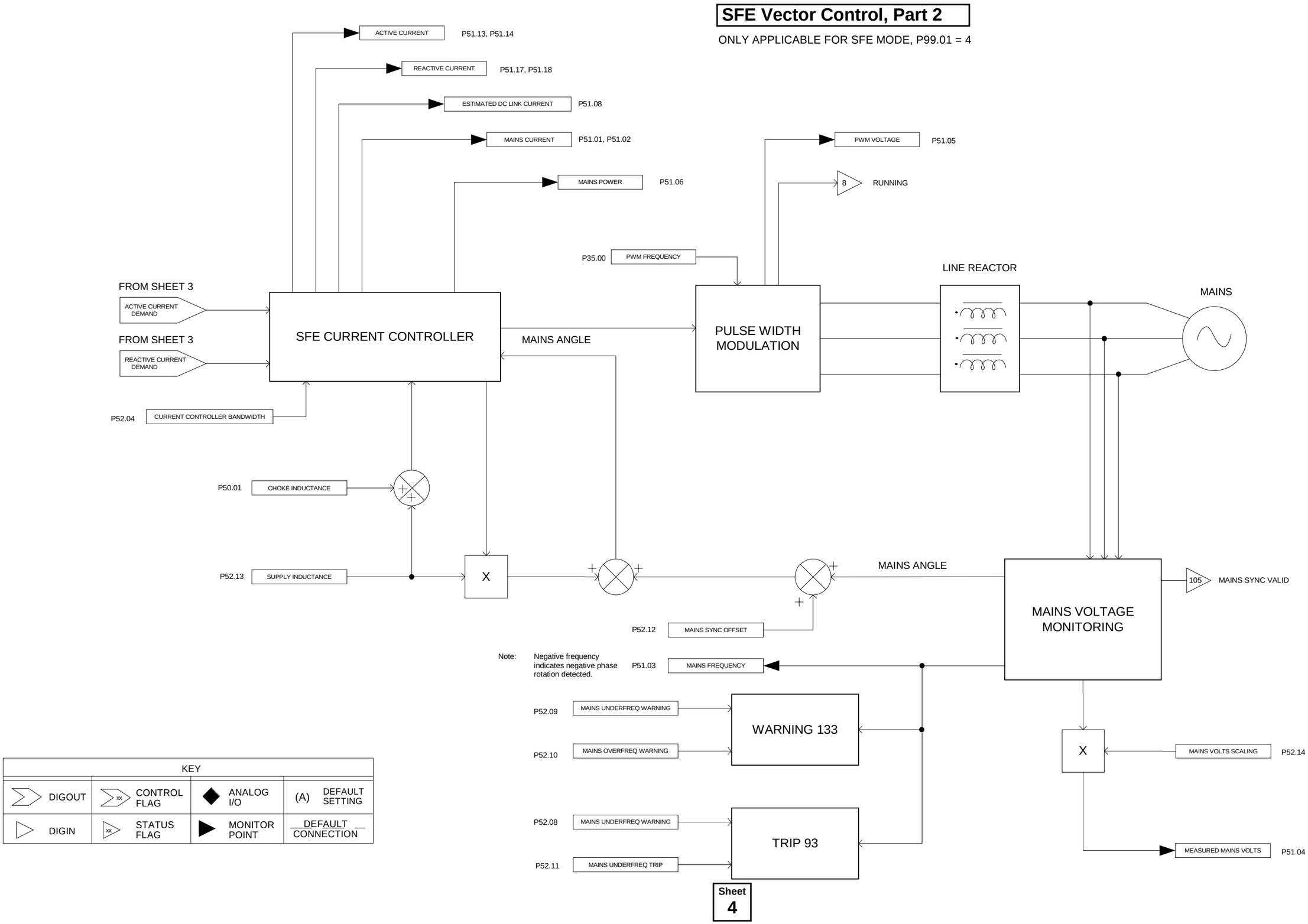
V dc AT REF (MENU 7) — DIGOUT 3

ANALOG O/P 1 — +/- 10V @ DEFAULT (MENU 7)

ANALOG O/P 2 — +/- 10V @ DEFAULT (MENU 7)

Sheet 2


SFE Vector Control, Part 1
ONLY APPLICABLE FOR SFE MODE, P99.01 = 4
P50.00
ANALOG REF1
ANALOG REF2
RS485 REF1
RS485 REF2
RS232 REF1
RS232 REF2
PID CONTROLLER
REF SEQUENCER
FIXED REF MENU
MOTORISED POT
TRIM REFERENCE
FIXED VAL OF 0
FIXED VAL OF 0
SUMMING NODE A
SUMMING NODE B
SUMMING NODE C
SUMMING NODE D
POINTER 21
Vdc REF SOURCE
P53.00
X
Vdc REF SCALE
P53.01
CLAMP
P51.00
P11.03
Vdc
DC LINK VOLTAGE PI CONTROL
Vdc AT REF
100
Vdc REF
P50.00
Vdc Kp
Vdc Ki
P52.02
P52.03
DC LINK CONTROLLER CURRENT DEMAND
P51.09
P52.00
DC LINK CONTROL BANDWIDTH
DC LINK CONTROLLER GAIN AUTO CALCULATION
P50.02
LOAD CONVERTER RATING
P52.01
DISABLE AUTO CALCULATION OF GAINS
VDC CONTROLLER
ACTIVE CURRENT DEMAND SOURCE
P53.04
ACTIVE CURRENT DEMAND SCALE
P53.05
SFE REF LOSS
106
ACTIVE CURRENT DEMAND IN POSITIVE LIMIT
101
ACTIVE CURRENT DEMAND
P51.11
P51.12
ACTIVE CURRENT DEMAND
TO SHEET 4
ACTIVE CURRENT DEMAND IN NEGATIVE LIMIT
102
ANALOG I/P REF 1
TB6/8,7
ANALOG I/P REF 2
TB6/6,5
DC LINK LOAD POWER FEEDFORWARD
FEEDFORWARD CURRENT DEMAND
P51.10
FEEDFORWARD POWER DEMAND
P51.07
P53.03
LOAD POWER SIGNAL SOURCE AND MODE
P52.15
CURRENT SENSOR TURNS RATIO
P52.16
CURRENT SENSOR BURDEN RESISTOR
REACTIVE CURRENT POSITIVE LIMIT
P52.06
P52.06
REACTIVE CURRENT POSITIVE LIMIT SOURCE
P53.12
REACTIVE CURRENT POSITIVE LIMIT SCALE
P53.13
P52.05
REACTIVE CURRENT REFERENCE SOURCE
P53.10
REACTIVE CURRENT REFERENCE SCALE
P53.11
REACTIVE CURRENT REFERENCE
103
REACTIVE CURRENT REF. IN POSITIVE LIMIT
104
REACTIVE CURRENT REF. IN NEGATIVE LIMIT
P52.07
REACTIVE CURRENT NEGATIVE LIMIT SOURCE
P53.14
REACTIVE CURRENT NEGATIVE LIMIT SCALE
P53.15
REACTIVE CURRENT NEGATIVE LIMIT
P52.07
P50.03
ACTIVE CURRENT POSITIVE LIMIT SOURCE
P53.06
ACTIVE CURRENT POSITIVE LIMIT SCALE
P53.07
ACTIVE CURRENT POSITIVE LIMIT
P50.03
-1
P50.04
ACTIVE CURRENT NEGATIVE LIMIT SOURCE
P53.08
ACTIVE CURRENT NEGATIVE LIMIT SCALE
P53.09
ACTIVE CURRENT NEGATIVE LIMIT
P50.04
TO SHEET 4
REACTIVE CURRENT DEMAND
REACTIVE CURRENT DEMAND
P57.15
P57.16
KEY
DIGOUT
CONTROL FLAG
ANALOG I/O
DEFAULT SETTING
DIGIN
STATUS FLAG
MONITOR POINT
DEFAULT CONNECTION
Sheet 3


SFE Vector Control, Part 2
ONLY APPLICABLE FOR SFE MODE, P99.01 = 4
ACTIVE CURRENT
P51.13, P51.14
REACTIVE CURRENT
P51.17, P51.18
ESTIMATED DC LINK CURRENT
P51.08
MAINS CURRENT
P51.01, P51.02
MAINS POWER
P51.06
PWM VOLTAGE
P51.05
8
RUNNING
P35.00
PWM FREQUENCY
LINE REACTOR
MAINS
FROM SHEET 3
ACTIVE CURRENT DEMAND
FROM SHEET 3
REACTIVE CURRENT DEMAND
SFE CURRENT CONTROLLER
MAINS ANGLE
PULSE WIDTH MODULATION
P52.04
CURRENT CONTROLLER BANDWIDTH
P50.01
CHOKE INDUCTANCE
P52.13
SUPPLY INDUCTANCE
X
MAINS ANGLE
MAINS VOLTAGE MONITORING
105
MAINS SYNC VALID
P52.12
MAINS SYNC OFFSET
Note:
Negative frequency indicates negative phase rotation detected.
P51.03
MAINS FREQUENCY
P52.09
MAINS UNDERFREQ WARNING
P52.10
MAINS OVERFREQ WARNING
WARNING 133
X
MAINS VOLTS SCALING
P52.14
P52.08
MAINS UNDERFREQ WARNING
P52.11
MAINS UNDERFREQ TRIP
TRIP 93
MEASURED MAINS VOLTS
P51.04
KEY
DIGOUT
CONTROL FLAG
ANALOG I/O
(A) DEFAULT SETTING
DIGIN
STATUS FLAG
MONITOR POINT
DEFAULT CONNECTION
Sheet 4

Machine Bridge Control System Overview

INTERLOCK — PLANT INTERLOCK (IF THIS INPUT IS OPEN, THE DRIVE WILL TRIP)

FOR PLANT I/O SEE MENU 7, SHEET 6

SELECT 110% or 150% OVERLOAD DUTY P99.02 (P1.29)

SELECT STANDARD OR ALTERNATE VOLTAGE GRADE P99.11

CHOOSE MOTOR CONTROL STRUCTURE P99.01

DIGIN 3 — REVERSE
DIGIN 4 — KEYPAD/REMOTE
DIGIN 5 — ANALOGUE REF1/2

ANALOG REF 1 — +/- 10V @ DEFAULT
ANALOG REF 2 — 4 - 20mA @ DEFAULT
KEYPAD SPEED REF

KEYPAD START/STOP

DIGIN 1 — STOP
DIGIN 2 — START
DIGIN 4 — KEYPAD/REMOTE

SPEED REFERENCE ARBITRATION — SHEET 7

"OFF" = KEYPAD
"OFF" = REF1
LOWEST FLAG "ON" WINS
SELECT 3 (6), SELECT 2 (5), SELECT 1 (4), DIRECTION (3)

MAX/MIN SPEEDS	P5.15 to P5.18 (P1.15 to P1.18)
JOG SPEEDS	P5.14 and P5.27
DIRECTION MODE	P5.11

SOURCE 1
SOURCE 2
SOURCE 3
SOURCE 4
4 REFERENCE SOURCES REFERENCE SELECTOR
BACKUP REFERENCE
MENU 5

DIRECTION 0 = FORWARD 1 = REVERSE
DIRECTION CONTROL — MAXIMUM SPEEDS, MINIMUM SPEEDS, DEMAND CLAMPS, DIRECTION INHIBITS, JOG SPEEDS — MENU 5

SKIP SPEEDS — MENU 22

CLAMP ZERO REFERENCE
SPEED REF TIME CONST. — MENU 5
TC

SPEED REF — P9.00/P1.00

DETAILS OF ALL POSSIBLE SPEED REFERENCE CHOICES

POSITION CONTROL — SHEET 13

FULL POSITION CONTROLLER, INCLUDING A FIXED POSITION MENU, A POSITION TEACHER, A UNI-DIRECTIONAL APPROACH AND A COMPREHENSIVE DATUMMING CONTROLLER

RAMPS — SHEETS 8, 9

RAMP RATES 1/2
SELECT RATES 1/2
RAMP FREEZE
S - SHAPING
MAX RAMP DEVIATIONS
MENU 6

=1, FREQUENCY
=2, VECTOR
=3, SCALAR

FREQUENCY CONTROL MODE — SHEET 8

REGEN POWER LIMIT P4.12
DC INJECTION BRAKING SET-UP — MENU 4
SYNCRO-STARTING MODE SET-UP — MENU 4
CURRENT CONTROL
CURRENT LIMIT AND TORQUE LIMIT SELECTIONS — MENU 3
SLIP COMPENSATION AND MOTOR STABILITY — MENU 3
FLUXING CONTROL AND VOLTAGE BOOST — MENU 3
SPEED TRIM SELECTIONS — MENU 24
BASIC MOTOR NAMEPLATE DATA — MENU 2

VECTOR CONTROL MODE — SHEETS 9 & 10

SPEED CONTROL AMPLIFIER
DROOP CONTROL ERROR DEADBAND — MENU 14
REGEN POWER LIMIT P4.12
MOTOR TEMP. COMPENSATION + FLUX LIMIT — MENU 12
TORQUE LIMIT CONTROL AND SELECTIONS — MENU 8
VECTOR CONTROL
ADVANCED MOTOR MODEL DATA — MENU 12
INERTIA COMPENSATION — MENU 25
BASIC MOTOR DATA — MENU 2
SPEED TRIM SELECTIONS — MENU 24

SELECT SPEED FEEDBACK SOURCE P13.00
BUMPLESS ENCODER LOSS RIDETHROUGH
ENCODERLESS SPEED FEEDBACK (=3)
TACHO SELECTIONS (=2)
=1
SPEED FEEDBACK
% = P9.01/P1.01
rpm = P9.03
MENU 13 | SHEET 10

SCALAR CONTROL MODE — SHEET 15

THIS IS A SPECIAL CONTROL MODE, FOR VERY SPECIALISED APPLICATIONS.
REFER TO SUPPLIER FOR DETAILS.

R S T
DC LINK VOLTS — P11.03
SHEET 11 — OPTIONAL DYNAMIC BRAKE — MENU 23
MOTOR VOLTS — P9.07/P1.04
MOTOR CURRENT — P9.05/P1.02
FREQUENCY — P9.09/P1.03
MOTOR
HARDWARE BRIDGE INTERLOCK
IGBT's + PWM
DRIVE O/P RUNNING
OUTPUT ENABLE/RUN
ENC
SHEET 11 — MOTOR AND DRIVE PROTECTION

STARTING AND STOPPING — SHEET 7

REMOTE START/STOP FLAGS AND BACKUP START/STOP FLAGS — MENU 4
START/STOP SEQUENCING
START MODE SYNCROSTART MODE
NORMAL STOP MODE RAPID STOP MODES STOP TIME LIMIT
ZERO SPEED HOLD TIMES
MENU 4
START AND STOP DRIVE

(DEFAULT START MODE — P4.00 = LOW FREQUENCY START)
(DEFAULT NORMAL STOP MODE — P4.07 = DISABLE AND COAST)
(DEFAULT RAPID STOP MODE — P4.08 = DISABLE AND COAST)

TRIPS/WARNINGS/DIAGNOSTIC MONITORS — SHEET 11

DIGIN 6 — TRIP RESET

TRIP MONITORING SYSTEM
10 PRESENT TRIPS.
10 PRESENT WARNINGS.
10 TRIP HISTORY STORAGE.
USER CONFIGURABLE TRIPS.
MOTOR PROTECTION
MENU 10
TRIP AVOIDANCE

HISTORY RECORDING
10 CHANNELS MONITOR ANY DRIVE PARAMETER
TRIGGER SET-UP
PRE AND POST TRIG
MANUAL TRIGGER
MENUS 26 and 27

MONITORING
EXTENSIVE SYSTEM MONITORS TO AID VIEWING AND DIAGNOSTICS
MENU 9 & 11

AUTO-RESETTING/STARTING
CONFIGURE THE DRIVE TO AUTO-RESET/RESTART AFTER A TRIP
CUSTOMER SELECTABLE RESET ENABLES
NUMBER OF RESETS AND TIMINGS OF RESETS — MENU 28

USING "NOT" TRIPPED ENSURES THAT WARNINGS DO NOT AFFECT THE HEALTHY OUTPUT

HEALTHY (MENU 7) — DIGOUT 1
OUTPUT RUNNING (MENU 7) — DIGOUT 2
AT SPEED (MENU 7) — DIGOUT 3

OTHER USEFUL MENUS

MENU 99 SECURITY CODES, PARAMETER BACKUP AND SYSTEM CONFIGURATIONS
MENU 35 KEYPAD REMOVAL, PARAMETER PRINTING AND PARAMETER "LOCKING"

APPLICATION LOGIC, SPECIAL MONITORING FUNCTIONS — SHEET 12

LOGIC GATES COMPARATORS DELAYS — MENU 30
STATUS FLAG BINARY GENERATOR — MENU 31
PROGRAMMABLE REFERNCE SHAPER ALLOWS THE USER TO "SHAPE" ANY OF THE DRIVES SIGNALS. — MENU 44
LOAD FAULT DETECTION WINDOW — ALLOWS PLANT CONDITION MONITORING — MENU 43
TORQUE MONITOR WINDOW — MENU 29
SPEED MONITOR WINDOW — MENU 29
12 — AT SPEED

SUMMING NODES, SWITCHES AND POINTERS — SHEET 14

MENU 40 PROGRAMMABLE SUMMING NODES, ALLOWING SCALING AND SUMMATION OF ANY DRIVE PARAMETER.
MENU 42 POINTERS. THESE POINTERS ARE ASSOCIATED WITH MOST OF THE DRIVE's REFERENCEC CHOICES, AND ALLOWS THE USER TO CHOOSE ANY DRIVE PARAMETER FOR THE REQUIRED USE.

DRIVE MONITORING MENUS — MENUS 9, 11 and 38

MENU 9 BASIC MONITORING OF THE MAIN DRIVE VARIABLES
MENU 11 ADVANCED NONITORING OF DRIVE VARIABLES, INCLUDING VECTOR CURRENTS, TEMPERATURES, CONTROL AND STATUS FLAGS HOURS RUN, ENERGY CONSUMED, DIGITAL I/O STATES, ANALOGUE INPUT AND OUTPUT VALUES AND OTHERS.
MENU 38 EXCLUSIVELY MONITORS ALL THE VARIABLES IN THE POSITION CONTROLLER

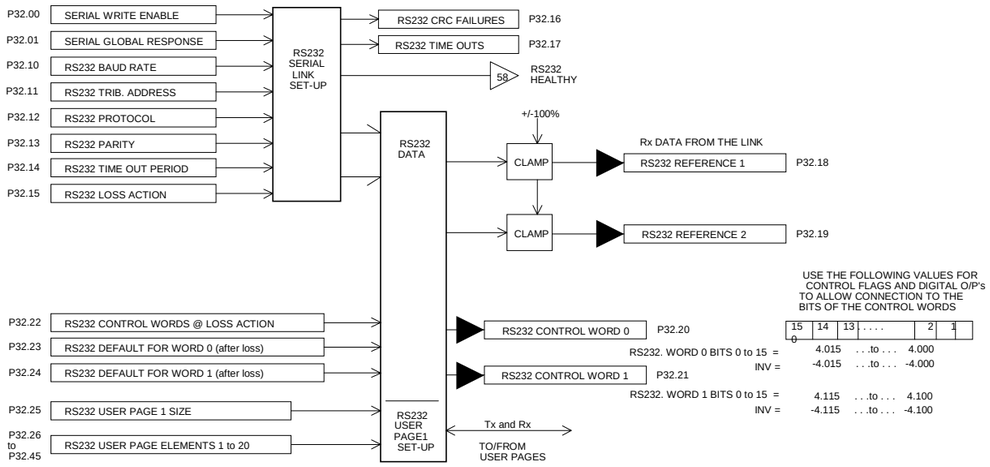
ANALOG O/P 1 — SPEED FEEDBACK — +/- 10V @ DEFAULT (MENU 7)
ANALOG O/P 2 — CURRENT FEEDBACK — +/- 10V @ DEFAULT (MENU 7)

KEY

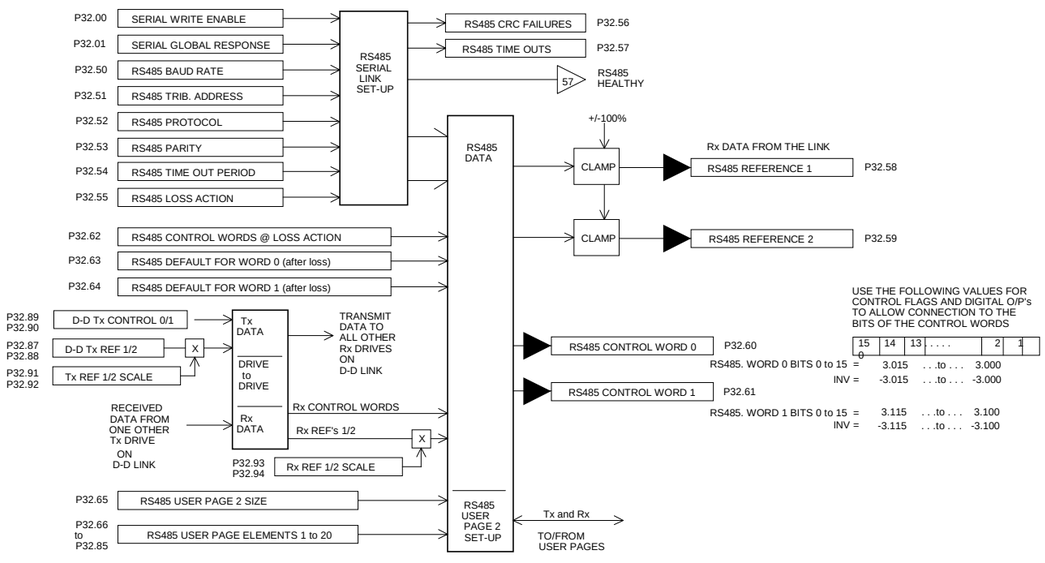
DIGOUT | CONTROL FLAG (XX) | ANALOG I/O | (A) DEFAULT SETTING
DIGIN | STATUS FLAG (XX) | MONITOR POINT | DEFAULT CONNECTION

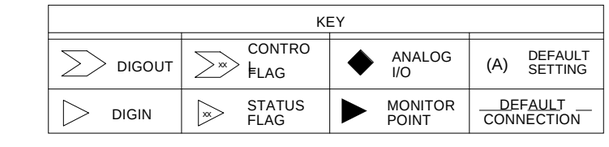
Sheet 5

RS232 SERIAL LINK


P32.00 SERIAL WRITE ENABLE
P32.01 SERIAL GLOBAL RESPONSE
P32.10 RS232 BAUD RATE
P32.11 RS232 TRIB. ADDRESS
P32.12 RS232 PROTOCOL
P32.13 RS232 PARITY
P32.14 RS232 TIME OUT PERIOD
P32.15 RS232 LOSS ACTION
RS232 SERIAL LINK SET-UP
RS232 CRC FAILURES P32.16
RS232 TIME OUTS P32.17
58 RS232 HEALTHY
RS232 DATA
+/-100%
CLAMP
CLAMP
Rx DATA FROM THE LINK
RS232 REFERENCE 1 P32.18
RS232 REFERENCE 2 P32.19
USE THE FOLLOWING VALUES FOR CONTROL FLAGS AND DIGITAL O/P's TO ALLOW CONNECTION TO THE BITS OF THE CONTROL WORDS
15 14 13 . . . . 2 1 0
P32.22 RS232 CONTROL WORDS @ LOSS ACTION
P32.23 RS232 DEFAULT FOR WORD 0 (after loss)
P32.24 RS232 DEFAULT FOR WORD 1 (after loss)
RS232 CONTROL WORD 0 P32.20
RS232. WORD 0 BITS 0 to 15 = 4.015 . . .to . . . 4.000
INV = -4.015 . . .to . . . -4.000
RS232 CONTROL WORD 1 P32.21
RS232. WORD 1 BITS 0 to 15 = 4.115 . . .to . . . 4.100
INV = -4.115 . . .to . . . -4.100
P32.25 RS232 USER PAGE 1 SIZE
P32.26 to P32.45 RS232 USER PAGE ELEMENTS 1 to 20
RS232 USER PAGE1 SET-UP
Tx and Rx
TO/FROM USER PAGES

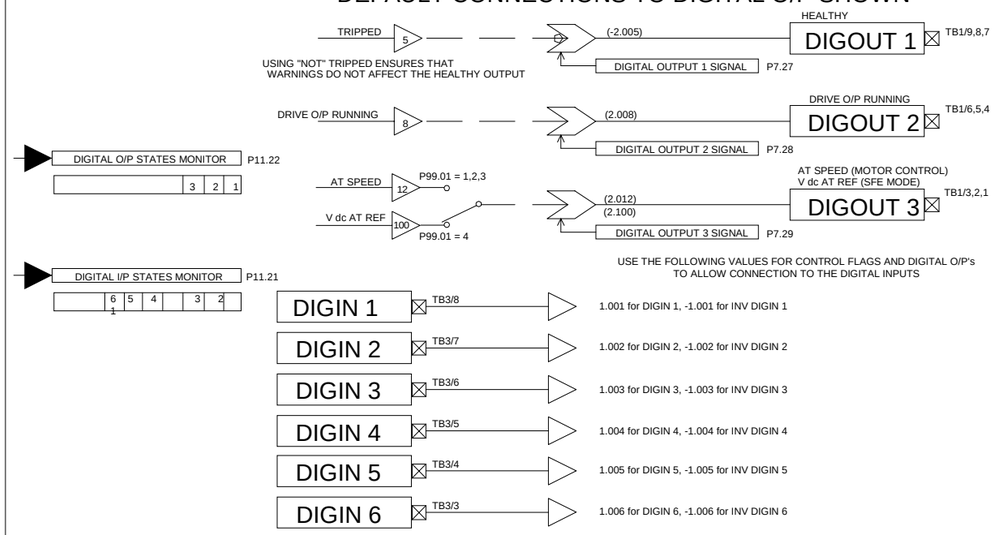
RS485 SERIAL LINK

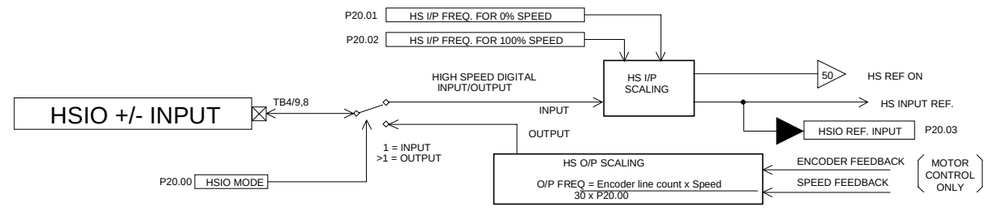

P32.00 SERIAL WRITE ENABLE
P32.01 SERIAL GLOBAL RESPONSE
P32.50 RS485 BAUD RATE
P32.51 RS485 TRIB. ADDRESS
P32.52 RS485 PROTOCOL
P32.53 RS485 PARITY
P32.54 RS485 TIME OUT PERIOD
P32.55 RS485 LOSS ACTION
RS485 SERIAL LINK SET-UP
RS485 CRC FAILURES P32.56
RS485 TIME OUTS P32.57
57 RS485 HEALTHY
RS485 DATA
+/-100%
CLAMP
CLAMP
Rx DATA FROM THE LINK
RS485 REFERENCE 1 P32.58
RS485 REFERENCE 2 P32.59
P32.62 RS485 CONTROL WORDS @ LOSS ACTION
P32.63 RS485 DEFAULT FOR WORD 0 (after loss)
P32.64 RS485 DEFAULT FOR WORD 1 (after loss)
USE THE FOLLOWING VALUES FOR CONTROL FLAGS AND DIGITAL O/P's TO ALLOW CONNECTION TO THE BITS OF THE CONTROL WORDS
15 14 13 . . . . 2 1 0
P32.89 P32.90 D-D Tx CONTROL 0/1
P32.87 P32.88 D-D Tx REF 1/2
P32.91 P32.92 Tx REF 1/2 SCALE
X
Tx DATA
DRIVE to DRIVE
Rx DATA
TRANSMIT DATA TO ALL OTHER Rx DRIVES ON D-D LINK
RECEIVED DATA FROM ONE OTHER Tx DRIVE ON D-D LINK
Rx CONTROL WORDS
Rx REF's 1/2
P32.93 P32.94 Rx REF 1/2 SCALE
RS485 CONTROL WORD 0 P32.60
RS485. WORD 0 BITS 0 to 15 = 3.015 . . .to . . . 3.000
INV = -3.015 . . .to . . . -3.000
RS485 CONTROL WORD 1 P32.61
RS485. WORD 1 BITS 0 to 15 = 3.115 . . .to . . . 3.100
INV = -3.115 . . .to . . . -3.100
P32.65 RS485 USER PAGE 2 SIZE
P32.66 to P32.85 RS485 USER PAGE ELEMENTS 1 to 20
RS485 USER PAGE 2 SET-UP
Tx and Rx
TO/FROM USER PAGES

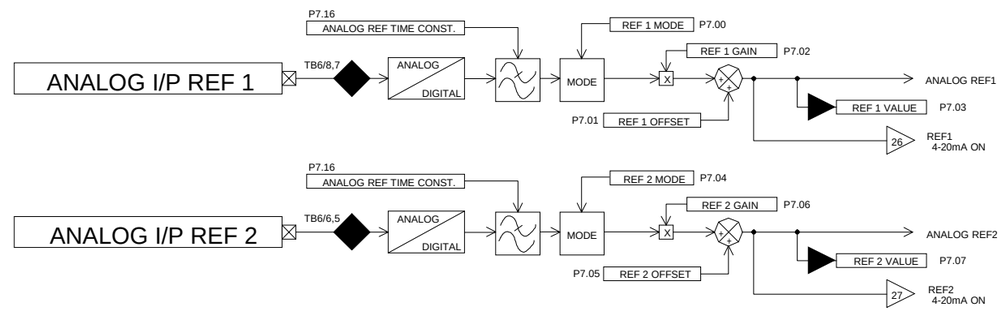


Plant I/O and Serial Links

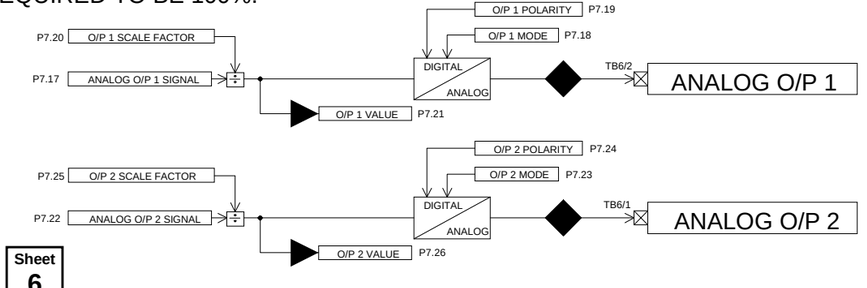
DEFAULT CONNECTIONS TO DIGITAL O/P SHOWN


TRIPPED 5
USING "NOT" TRIPPED ENSURES THAT WARNINGS DO NOT AFFECT THE HEALTHY OUTPUT
(-2.005)
HEALTHY
DIGOUT 1
TB1/9,8,7
DIGITAL OUTPUT 1 SIGNAL P7.27
DRIVE O/P RUNNING 8
(2.008)
DRIVE O/P RUNNING
DIGOUT 2
TB1/6,5,4
DIGITAL OUTPUT 2 SIGNAL P7.28
DIGITAL O/P STATES MONITOR P11.22
3 2 1
AT SPEED 12
V dc AT REF 100
P99.01 = 1,2,3
P99.01 = 4
(2.012)
(2.100)
AT SPEED (MOTOR CONTROL)
V dc AT REF (SFE MODE)
DIGOUT 3
TB1/3,2,1
DIGITAL OUTPUT 3 SIGNAL P7.29
DIGITAL I/P STATES MONITOR P11.21
6 5 4 3 2 1
USE THE FOLLOWING VALUES FOR CONTROL FLAGS AND DIGITAL O/P's TO ALLOW CONNECTION TO THE DIGITAL INPUTS
DIGIN 1 TB3/8 1.001 for DIGIN 1, -1.001 for INV DIGIN 1
DIGIN 2 TB3/7 1.002 for DIGIN 2, -1.002 for INV DIGIN 2
DIGIN 3 TB3/6 1.003 for DIGIN 3, -1.003 for INV DIGIN 3
DIGIN 4 TB3/5 1.004 for DIGIN 4, -1.004 for INV DIGIN 4
DIGIN 5 TB3/4 1.005 for DIGIN 5, -1.005 for INV DIGIN 5
DIGIN 6 TB3/3 1.006 for DIGIN 6, -1.006 for INV DIGIN 6





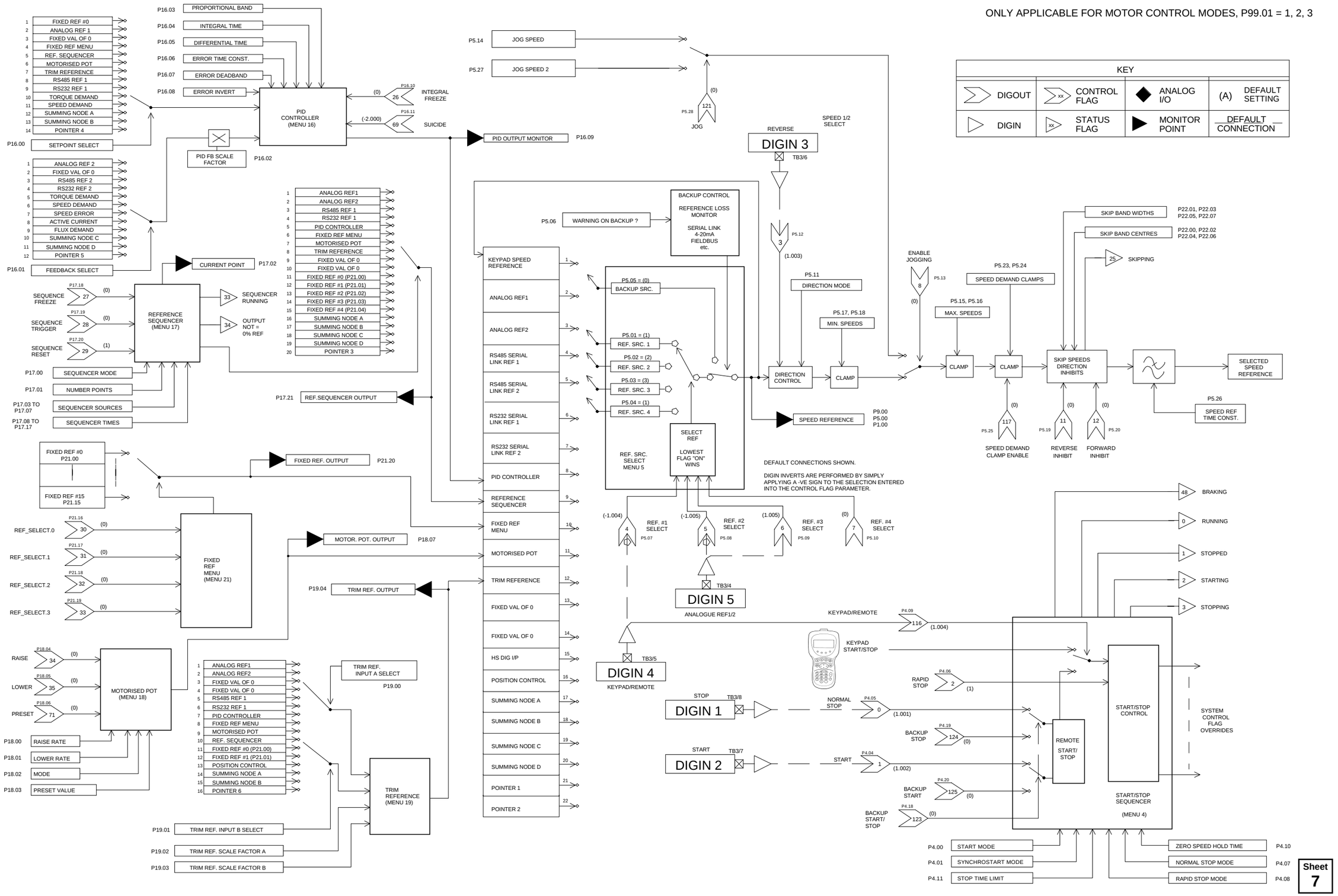
WHEN USING THE O/P SCALERS, SIMPLY EDIT IN THE VALUE THAT IS REQUIRED TO BE 100%.



Sheet 6

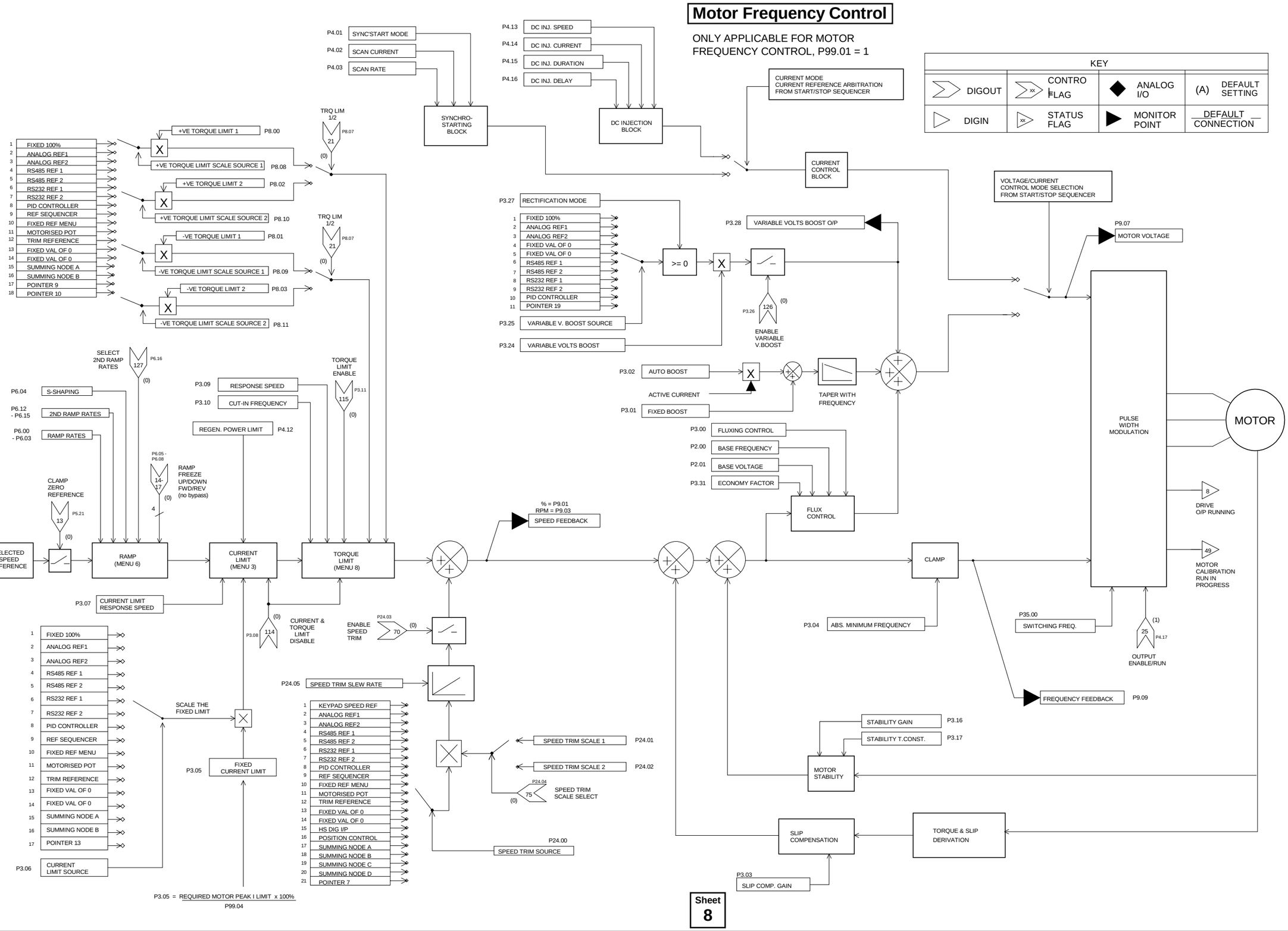
Reference Arbitration and Starting/Stopping

ONLY APPLICABLE FOR MOTOR CONTROL MODES, P99.01 = 1, 2, 3



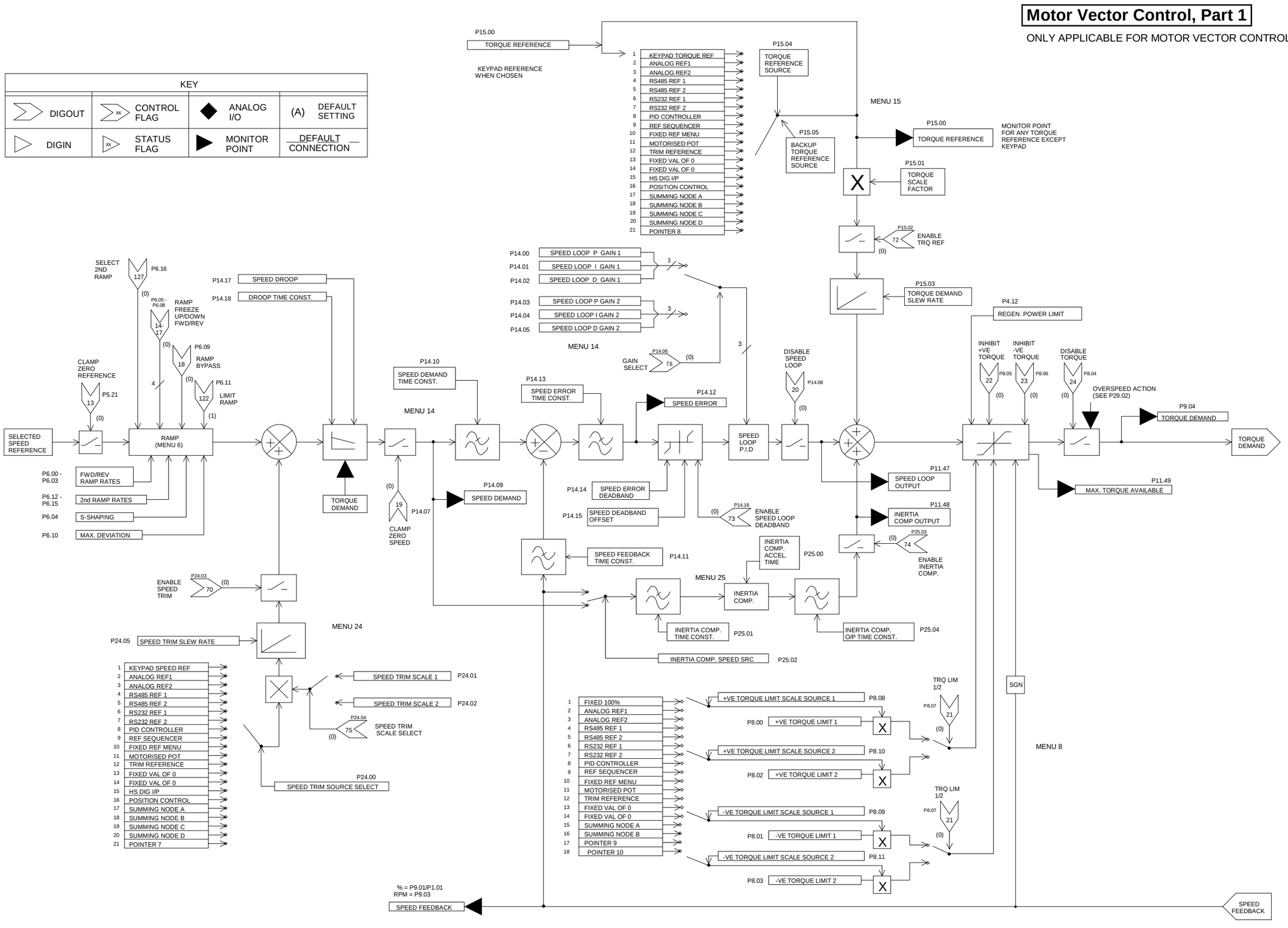
Motor Frequency Control

ONLY APPLICABLE FOR MOTOR FREQUENCY CONTROL, P99.01 = 1



Motor Vector Control, Part 1

ONLY APPLICABLE FOR MOTOR VECTOR CONTROL, P99.01 = 2



Sheet 9

Motor Vector Control, part 2

ONLY APPLICABLE FOR MOTOR VECTOR CONTROL, P99.01 = 2

KEY

DIGOUT	CONTROL FLAG	ANALOG I/O	(A) DEFAULT SETTING
DIGIN	STATUS FLAG	MONITOR POINT	DEFAULT CONNECTION

TORQUE DEMAND

P12.04 MOTOR TEMP. COMPENSATION

P12.08 TEMP. COMP. SOURCE

1 FIXED 100%
2 ANALOG REF1
3 ANALOG REF2
4 FIXED VAL OF 0
5 FIXED VAL OF 0
6 RS485 REF 1
7 RS485 REF 2
8 RS232 REF 1
9 RS232 REF 2
10 PID CONTROLLER
11 SUMMING NODE C
12 SUMMING NODE D
13 POINTER 11

ENABLE MANUAL TEMPERATURE COMPENSATION

P12.05 77 (1)

EFFECTIVE ROTOR RESISTANCE =
P12.15-P12.15 x (100%-P12.04 / 100%) x (TEMP. COMP. SCALE / 100%)

MENU 12

P12.07 TEMPERATURE COMPENSATION GAIN

AUTOMATIC Rr IDENTIFICATION
Rr > 0.5xP12.15
Rr < 1.5xP12.15

P12.09 ESTIMATED TEMPERATURE COMPENSATION

AUTO TEMP. COMP.
P12.06 0 = DISABLED (MANUAL)
1 = ENABLED (AUTO)

AUTO MANUAL

FLUX LIMIT SRC. P12.24

1 P12.23-FLUX LIMIT
2 ANALOG REF1
3 ANALOG REF2
4 RS485 REF 1
5 RS485 REF 2
6 RS232 REF 1
7 RS232 REF 2
8 PID CONTROLLER
9 REF SEQUENCER
10 FIXED REF MENU
11 MOTORISED POT
12 TRIM REFERENCE
13 FIXED VAL OF 0
14 FIXED VAL OF 0
15 SUMMING NODE A
16 SUMMING NODE B
17 POINTER 12

NOTE: CLAMPED TO RANGE 20%-100%

MENU 12

BASIC MOTOR NAMEPLATE DATA
MENU 2

MOTOR BASE FREQ. P2.00
MOTOR BASE VOLTS P2.01
MOTOR FULL LOAD I P2.02
MOTOR NOM. POWER P2.03
MOTOR NOM. SPEED P2.04
MOTOR POWER FACTOR P2.05

MOTOR PEAK I @ NOM. SPEED P12.01
MOTOR PEAK I @ 0% SPEED P12.29
MOTOR PEAK I @ 100% SPEED P12.30

MAX. POSSIBLE MOTOR FLUX CALCULATION

OUTPUT FREQUENCY
DC LINK VOLTAGE

FLUX LIMIT ENABLE
P12.25 68 (0)

MOTOR MODEL

P12.00 - MOTOR MAGNETISING CURRENT
P12.01 - MOTOR PEAK CURRENT @ NOMINAL SPEED
P12.02 - NOMINAL MAINS SUPPLY VOLTS
P12.11 - STATOR RESISTANCE
P12.12 - STATOR LEAKAGE INDUCTANCE
P12.13 - MAGNETISING RESISTANCE
P12.14 - MAGNETISING INDUCTANCE
P12.15 - ROTOR RESISTANCE
P12.16 - ROTOR LEAKAGE INDUCTANCE
P12.17 - MOTOR MAGNETISING CURRENT @ 50% BASE VOLTS
P12.18 - MOTOR MAGNETISING CURRENT @ 60% BASE VOLTS
P12.19 - MOTOR MAGNETISING CURRENT @ 70% BASE VOLTS
P12.20 - MOTOR MAGNETISING CURRENT @ 80% BASE VOLTS
P12.21 - MOTOR MAGNETISING CURRENT @ 90% BASE VOLTS
P12.22 - LEAKAGE VOLTS

VECTOR CONTROL

P12.27 CURRENT CONTROL BANDWIDTH

PULSE WIDTH MODULATION

M

8 DRIVE O/P RUNNING

49 MOTOR CALIBRATION RUN IN PROGRESS

P35.00 SWITCHING FREQ.

25 P4.17 (1) OUTPUT ENABLE/RUN

ENC

P13.17 (0) 119 FORCE ENCODER LOSS

P13.18 (0) 120 RESET ENCODER LOSS

ACTION ON LOSS 13.02
MAX. SPEED CHANGE 13.08
MAX. REVERSALS 13.19
REVERSALS THRESH. 13.20

ENCODER LOSS 59

SELECT BACKUP FEEDBACK
P13.03 118 (0)

MENU 13

ENCODER MONITOR

ENC. ANGLE 13.10
ENC. REVERSALS 13.07

ENCODER LINE COUNT P13.04/P13.05
MAX. SPEED FWD P5.15
MAX. SPEED REV P5.16

ENCODER SPEED FEEDBACK & SCALING

P13.00 SPEED FB SOURCE
P13.01 SPEED FB BACKUP SRC

SPEED FEEDBACK SELECT

SPEED FEEDBACK

SPEED FEEDBACK
% = P9.01.P1.01
RPM = P9.03

P11.51 (%) ENCODER SPEED

THIS PARAMETER IS ACTIVE IN FREQUENCY CONTROL MODE TO ALLOW SAFE ENCODER CHECKING

SGN

9 REVERSE SPEED (motor going in reverse)

TACHO SPEED FEEDBACK & SCALING

1 ANALOG REF1
2 ANALOG REF2
3 FIXED VAL OF 0
4 FIXED VAL OF 0
5 RS485 REF 1
6 RS485 REF 2
7 RS232 REF 1
8 RS232 REF 2
9 HI SPEED INPUT
10 POINTER 18

TACHO FEEDBACK SRC. P13.14
TACHO FEEDBACK SCALE P13.15
TACHO FEEDBACK T.CONST. P13.16

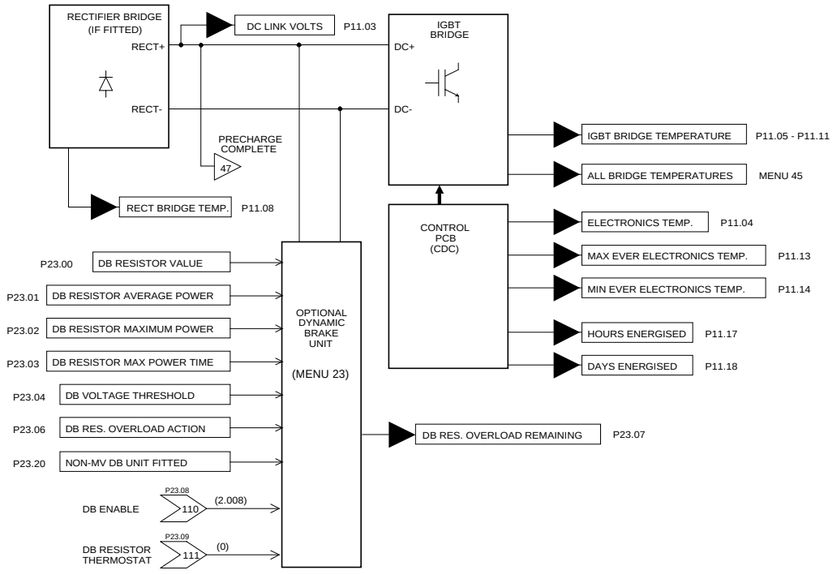
ENCODERLESS SPEED ESTIMATION & SCALING

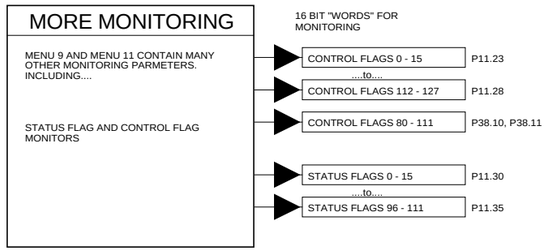
MATHEMATICAL MOTOR MODEL

ENABLE Rs TRACKER P12.28

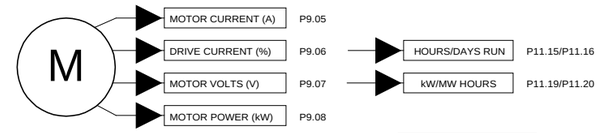
Sheet 10

Trips/Warnings and Diagnostic Monitoring

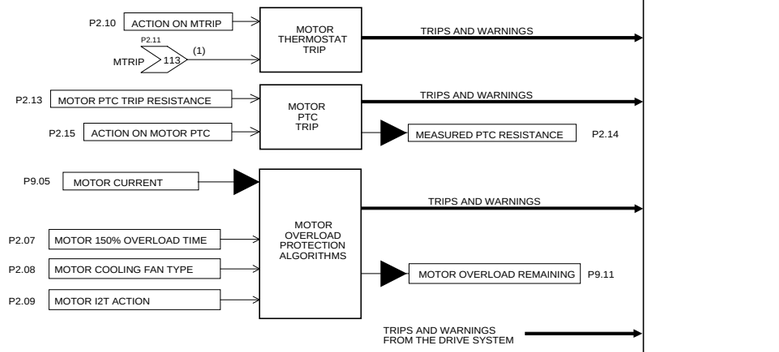




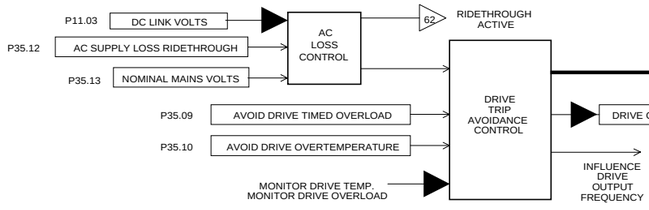
MOTOR MONITORING (MOTOR CONTROL MODES ONLY)



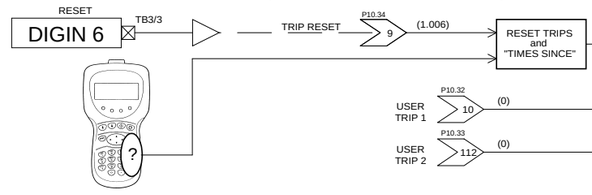
MOTOR PROTECTION/TRIP AVOIDANCE (MOTOR CONTROL MODES ONLY)

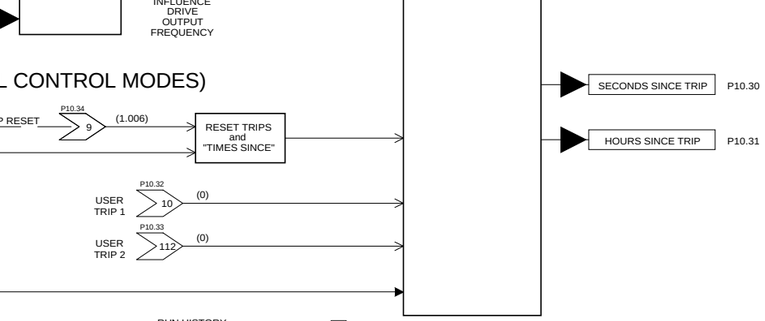


DRIVE TRIP AVOIDANCE (MOTOR CONTROL MODES ONLY)

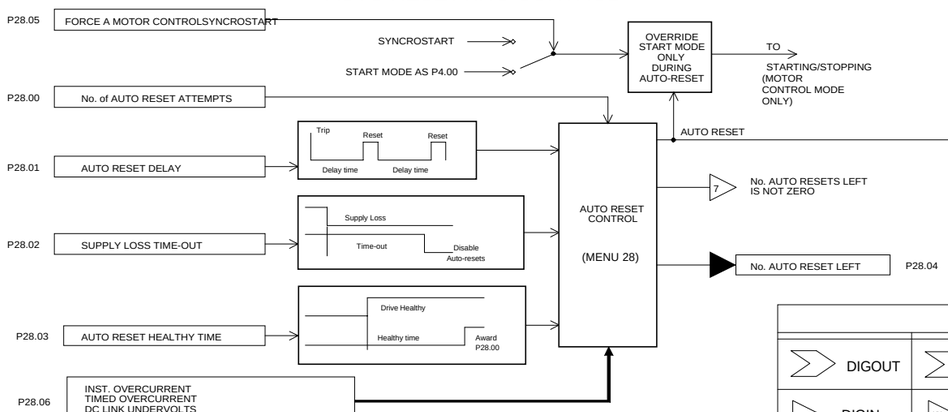


TRIP RESETTING and USER TRIPS (ALL CONTROL MODES)





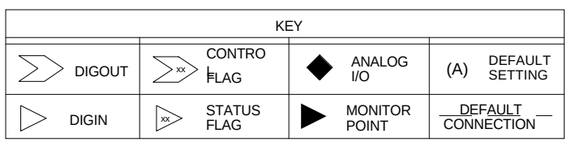
AUTO RESETTING CONTROL



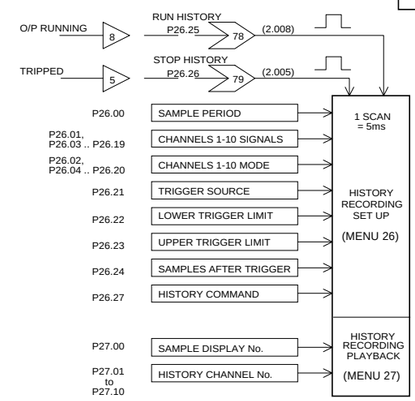
AUTO RESETTING ENABLES

WARNING

If the drive is configured to auto-restart, the motor can start rotating without an operator command. Take precautions to prevent injury to personnel.



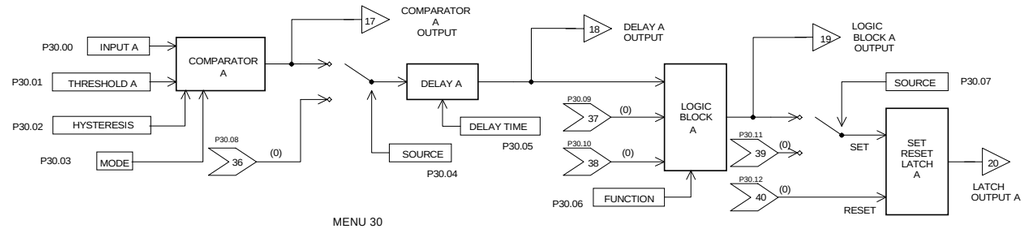
ON BOARD DIAGNOSTIC HISTORY CHART RECORDER



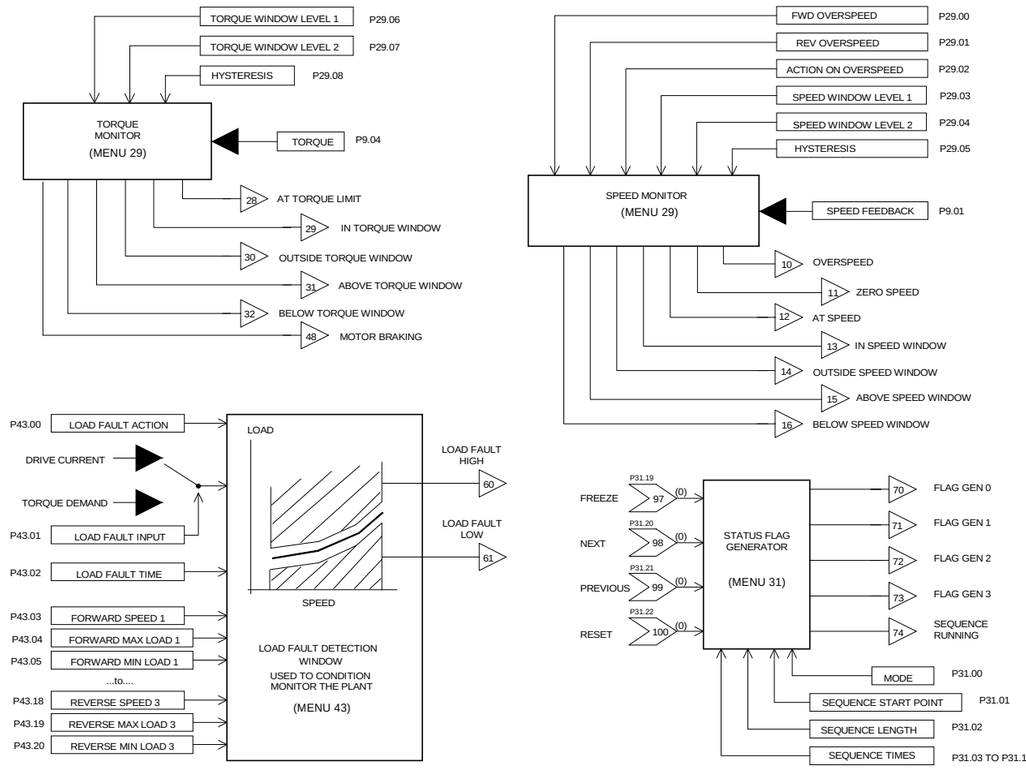
Sheet 11

Application Logic, Special Monitoring Functions

GENERAL PURPOSE LOGIC BLOCKS



APPLICATION MONITORS AND SPECIAL FUNCTIONS, MOTOR CONTROL MODES ONLY

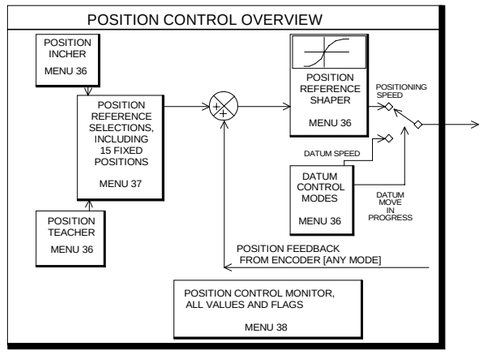


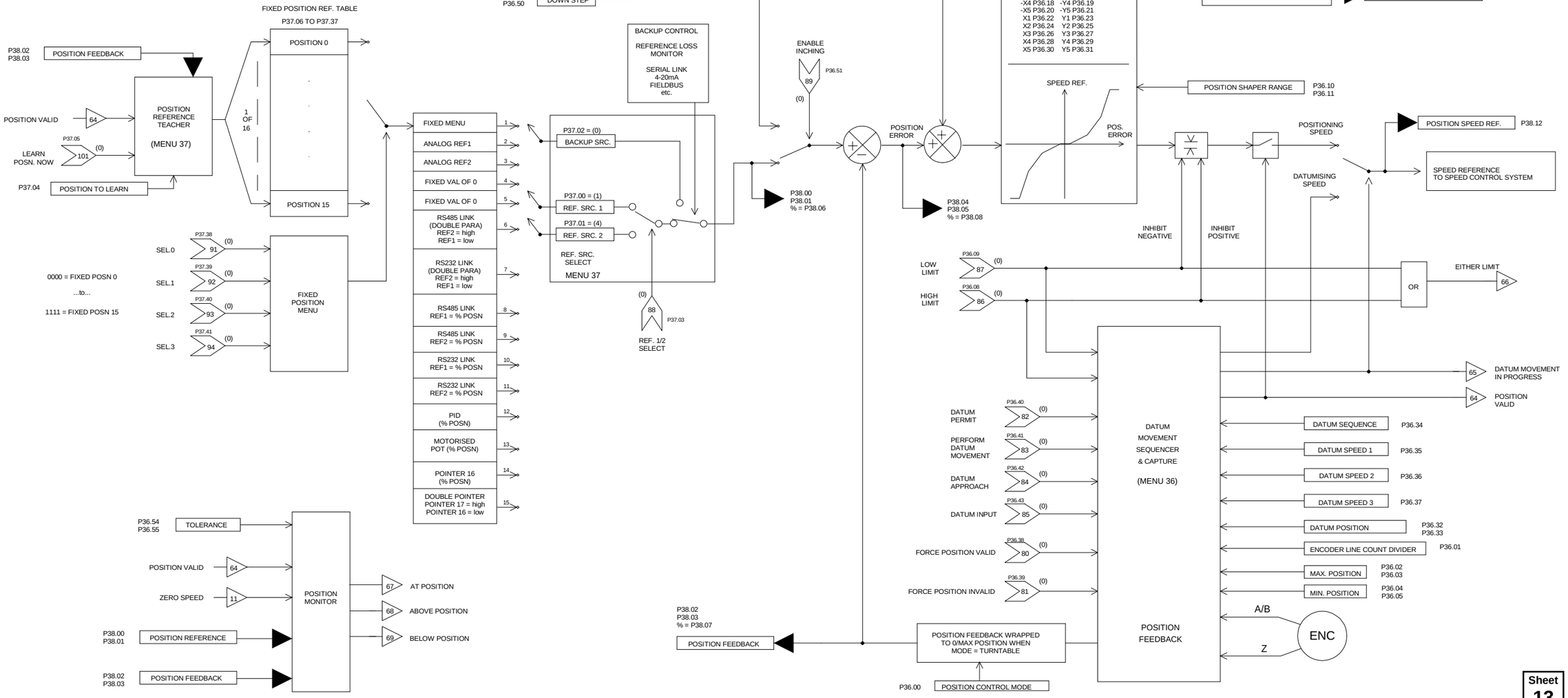
KEY			
DIGOUT	CONTROL FLAG	ANALOG I/O	(A) DEFAULT SETTING
DIGIN	STATUS FLAG	MONITOR POINT	DEFAULT CONNECTION

Sheet 12

Motor Position Controller

ONLY APPLICABLE FOR MOTOR CONTROL MODES, P99.01 = 1, 2, 3



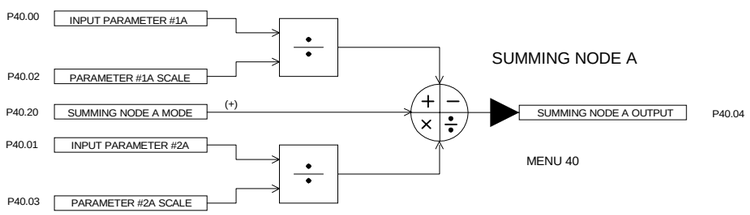


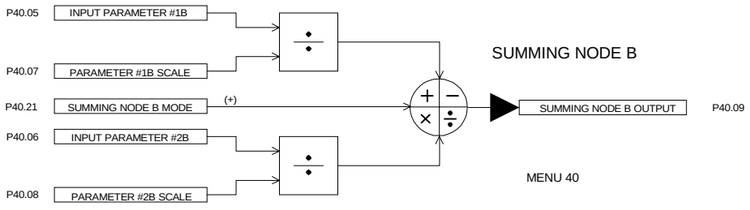
Sheet 13

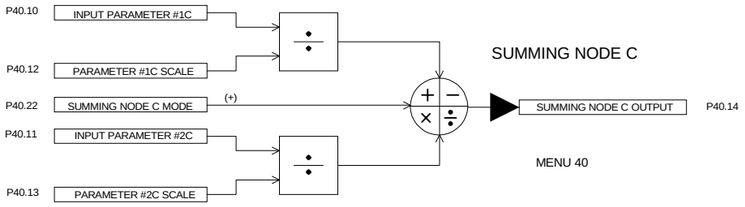
THE EQUATION BELOW SHOWS HOW SUMMING NODES A, B, C & D OPERATE. THE FOUR DIAGRAMS ARE A LOGICAL REPRESENTATION.

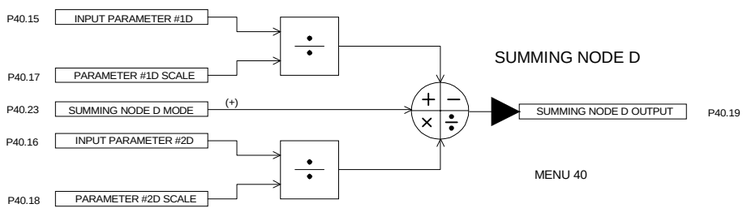
$$\text{SUMMING NODE OUTPUT} = \left(\left(\frac{\text{SUMMING NODE INPUT 1}}{\text{SUMMING NODE SCALE 1}}\right) ? \left(\frac{\text{SUMMING NODE INPUT 2}}{\text{SUMMING NODE SCALE 2}}\right)\right) \times 100.00\%$$

WHERE ? IS THE CHOSEN MODE (+, −, X or ÷)







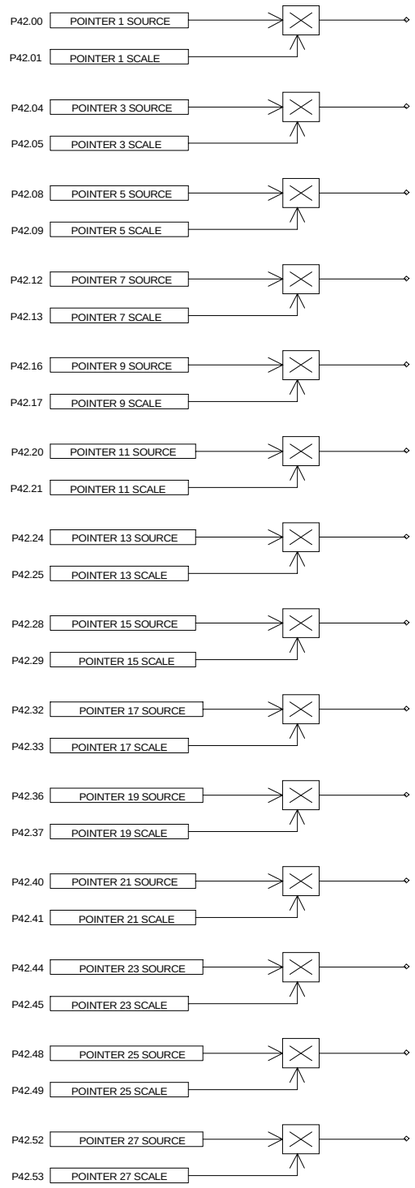


KEY			
DIGOUT	CONTROL FLAG	ANALOG I/O	(A) DEFAULT SETTING
DIGIN	STATUS FLAG	MONITOR POINT	DEFAULT CONNECTION

Summing Nodes and Pointers

THE POINTERS BELOW CAN BE USED BY SIMPLY SELECTING THE RELEVANT POINTER FROM THE LIST OFFERED IN THE RELEVANT REFERENCE CHOICE.

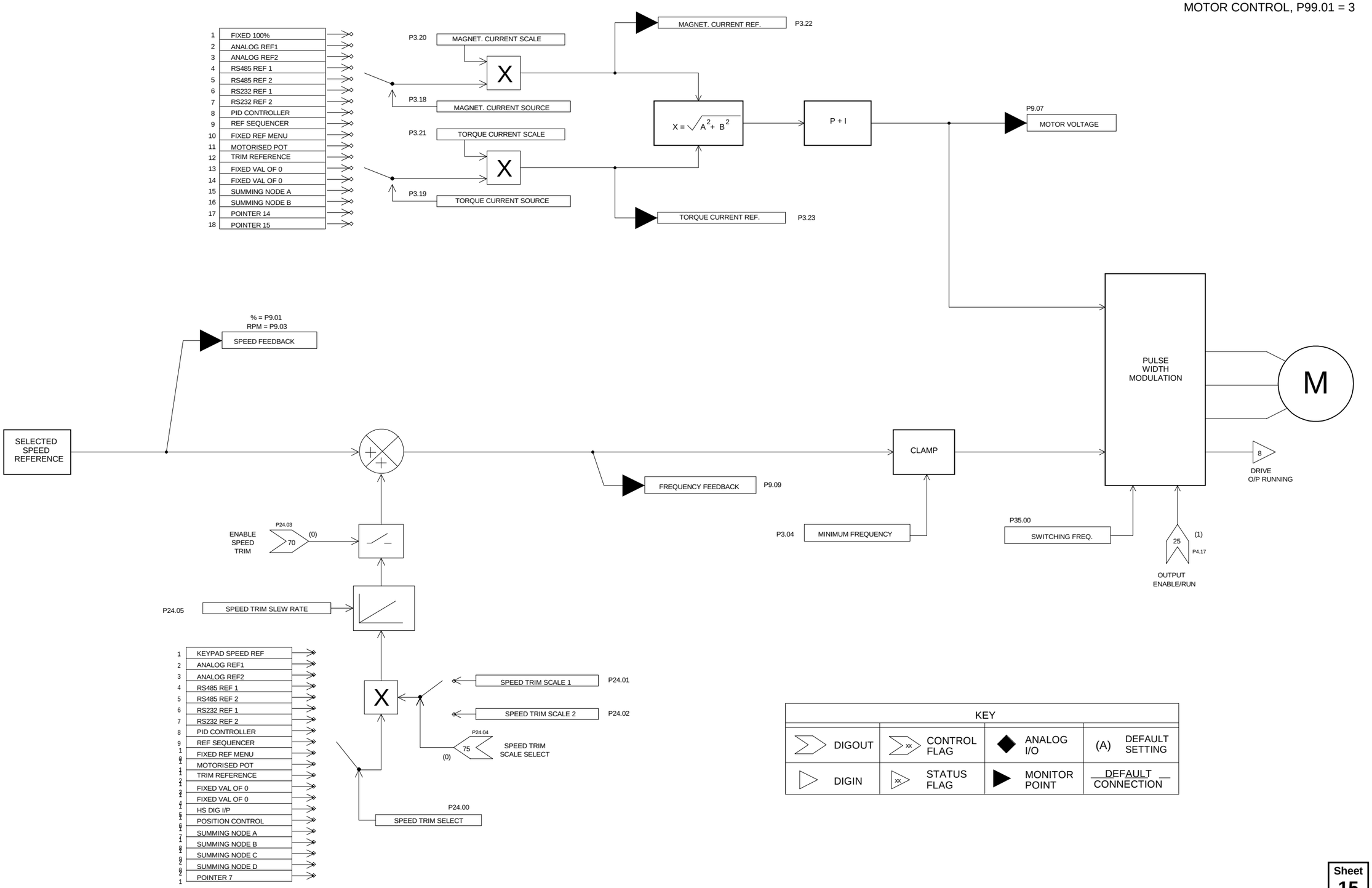
E.G. CHOOSE POINTER 1 FROM THE SPEED REFERENCE CHOICE SELECTION (SHEET 2) THEN CONFIGURE POINTER 1 BELOW.
THE POINTER SOURCES CAN BE ANY DRIVE PARAMETER.



Sheet 14

Scalar Control

ONLY APPLICABLE FOR SCALAR MOTOR CONTROL, P99.01 = 3



Sheet 15

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6. Diagnostics

6.1 Describing the Diagnostic Philosophy

This section of the guide deals with 2 main issues. Problems with using the case and the way in which the ALSPA MV3000 presents diagnostic information to the user of the drive. The case has been designed to allow the extensive diagnostic features of the ALSPA MV3000 to be demonstrated in a safe and convenient way.

The case diagnostics are dealt with in Section 6.3, and allow the user to successfully diagnose problems whilst operating the case.

The rest of Section 6 is a generic description of the ALSPA MV3000 diagnostic system, re-produced here, so that effective demonstrations can be performed.

6.2 LED Fault Indicators

A fault condition is indicated by illumination of the WARNING or flashing TRIPPED indicator and extinguishing of the HEALTHY/STANDBY indicator.

The four LED indicators on the DDM™ (❾) are repeated on the DDM™ Harbour (❽) and give a first indication of case status. The DDM™ Harbour indicators are shown in Section 4.6.1 and the DDM™ indicators are shown on the rear cover.

6.3 Diagnosing faults with the Case

Whilst using the case, problems may be experienced. Many of these problems can be solved by correct use of the case controls. For convenience, a list of likely problems and their solutions are given on the inside rear cover of this guide, however:

In general, most of the problems encountered when using the case can be corrected by carrying out the following short procedure:

1. Ensure all the potentiometers in the power frame simulator (⑦), are all in the 12 O'clock position.
2. Ensure the green switches in the power frame simulator (⑦), are all ON (pressed in).
3. Ensure the green switch labelled 4-20mA loss (⑩), is switched ON (pressed in).
4. Ensure all the plant digital input switches (③) are all OPEN (up).
5. Ensure the Drive Data Manager (❾), is in its harbour (❽) or on its lead.
6. Carry out a trip reset by pressing the "?" key on the DDM™ (❾), and choosing option 3 from the menu which is provided
7. The CDC board (❸) should be healthy, and this can be determined by the green healthy/standby LED on the DDM™ (❾), the rear cover of this guide has a picture of the DDM™, so the healthy/standby LED can be identified.

If the case does not power up healthy, it is possible that the parameter edits stored in the CDC board (❸) are at fault, as the user is able to generate faults, e.g. User Trip 1. Default the parameters by carrying out the procedure described in section 5.1.9, then repeat the above procedure.

6.4 Warnings

It is possible to use the controls on the case to simulate warning conditions. A list of warnings which can be simulated by the case is shown on the rear cover and a description of how to use the controls to produce these faults is described in Section 4.3. A complete list of ALSPA MV3000 warnings is given in the optional software manual T1678 and the Getting Stated Manual T1676.

If the WARNING indicator is lit a problem has occurred which is not sufficiently serious to trip the case. A warning code is stored in one of 10 locations in the Warning Record, parameters P10.00 to P10.09, the code stored in P10.00 being for the most recent warning, it is important that all warning codes are viewed to gain a complete picture.

Note: Warnings are not latched and if the warning condition ceases, the WARNING indicator will extinguish. (At default, Warning 1 is duplicated at P1.06).

6.5 Trips

It is possible to use the controls on the case to simulate trip conditions. A list of trips which can be simulated by the case is shown on the rear cover and a description of how to use the controls to produce these faults is described in Section 4.3. A complete list of ALSPA MV3000 trips is given in the optional software manual T1678 and the Getting Stated Manual T1676.

If the TRIPPED indicator is flashing, a fault has occurred which has caused the case to shut down. In a real plant situation, the drive may be at fault, but usually the drive has tripped in response to a problem on the plant, and the drive has protected the installation.

Each time a trip occurs a Fault is stored in one of ten locations in the Active Trip record, parameters P10.10 to P10.19, the fault stored in P10.10 being for the most recent trip, it is important that all trip codes are viewed to gain a complete picture. These trips are then stored forever in a Trip History, storing the last 10 active trips, in P10.20 to P10.29.

Note: Trips are latched and must be reset before the case can be operated again. See Section 6.6.3 to reset the trip.

6.6 Viewing Warnings and Trips

Parameters in the case report the trip or warning currently present, and other parameters hold a history of the last 10 trips. These parameters display codes and text which describe particular warnings or trips, the DDM™ automatically displays these text messages. Menu 10 is dedicated to trips and warnings, but at default Menu 1 also has some of these parameters collected together for easy access.

Available parameters in Menu 01

P1.06 = FIRST WARNING
P1.07 - P1.08 = FIRST 2 TRIPS

Available parameters in Menu 10

P10.00 - P10.09 = WARNINGS 1 to 10
P10.10 - P10.19 = CURRENT TRIPS 1 to 10
P10.20 - P10.29 = TRIP HISTORY 1 to 10

Viewing using the navigation keys

Navigate to one of the above parameters, either a Trip or a Warning, and note the code and the text message, remember to view all, not just the first one.

Viewing using the "help" key

1. When the drive is showing either a Trip or Warning, press (?) to view diagnostic menu. If the DDM™ is connected and has not been used for about 5 minutes, this menu will appear automatically. See Section 6.7 for more information on using the help key.
2. The DDM™ will display a diagnostics menu, choose the relevant option.
3. See Section 6.6.1 and Section 6.6.2 for what to do when a trip or warning occurs.

6.6.1 Action in the Event of a Warning

1. Press (?) and select "2" – Display Warnings. See Section 6.7 for more information on using the help key.
2. P10.00 will be displayed, note the first warning. This is the problem which is causing the warning indication.
3. In turn, Display P10.01 to P10.09 and note any additional warnings. Any warnings in these locations will be for secondary problems and will help with diagnosis.
4. Refer to the rear cover and check the meaning of each warning. Take corrective action as necessary.

6.6.2 Action in the event of a Trip

1. Press (?) and select "2" – Display Trips. See Section 6.7 for more information on using the help key.
2. P10.10 will be displayed, note the most recent trip. This is the problem which has caused the trip indication. (For the default configuration, Trips 1/2 are located at P1.07/P1.08).
3. In turn, Display P10.11 to P10.19 and record any additional trips which may be present.
4. Refer to the table inside the rear cover and check the meaning of each fault. Take corrective action as necessary.
5. See Section 6.6.3 for resetting trips.

6.6.3 Resetting Trips

From the Digital Inputs

From Default, toggle ON then /OFF the switch wired to DIGIN 6.

Note: At Default, DIGIN 6 is connected to Control Flag 9 (the Reset flag) which may have been re-programmed.

From the DDM™

Press (?) and select option 3 (Attempt Trip Reset), see Section 6.7 for more information on using the help key.

6.6.4 Fault Codes

Some of the more common Trip and Warning fault codes are listed inside the rear cover. For this user guide, the codes are specific to those which can be seen whilst using the demonstration case.

For a full listing and description, refer to the optional Software Technical Manual T1679.

6.7 Using the HELP Key for diagnostics

If the case trips, get information on the trip by pressing (?).

A screen appears, giving four choices, as shown:

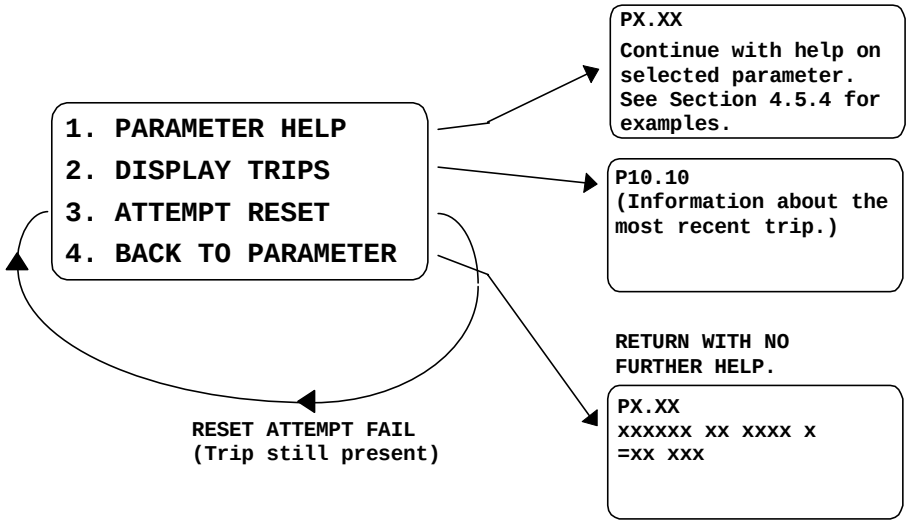

Figure 6-1 Help screen for trips

PRESSING

1 Allows the user to view parameter help when a trip is present.

2 Displays parameter P10.10 – giving information about the trip.

3 Attempts to reset the trip. If the attempt fails, this screen re-appears.

4 Return to the parameter being viewed before the "?" was pressed, with no further help.

If the case shows a Warning, get information on the warning by pressing (?).

The HELP system works as described for trips, except the diagnostic menu is modified to allow warnings to be displayed. Pressing option 2 displays P10.00

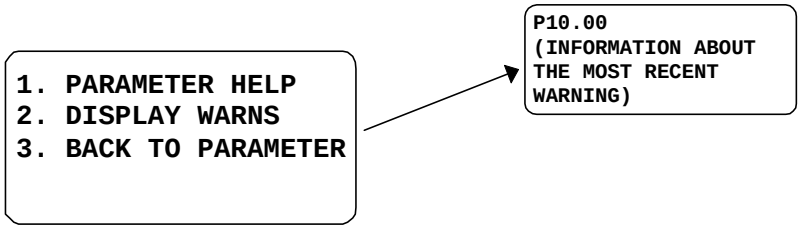

Figure 6-2 Help screen for warnings

6.8 Diagnostic Hints

There are a number of approaches the user can take to diagnose a problem:

1. Refer to Section 6.3, for a list of actions to take to make the case healthy
2. There is a list of helpful hints recorded on the inside of the rear cover of this user manual.
3. Use Sections 6.6 and 6.7 to find out what the problem is. The trip or warning messages give a clue to the problem and the trip/warning meanings inside the rear cover of this guide will also help.
4. The case will normally only trip if one or more of the controls of the case are in a state which simulates a fault, so the trip code will point towards one of the case controls.
5. View the trip history in P10.20 to P10.29 for a list of the last 10 reasons why the case has tripped. This list however, will only be a record of the last 10 things the case has been asked to trip on by adjusting the relevant controls.

6.9 Changing a Case Fuse

The case fuse may blow during the life of the equipment, carry out the following procedure when changing the fuse:

1. Disconnect the case from the mains by switching the mains off at the case and pulling the IEC mains cable out (❹).
2. The mains connector (❹) has a small draw which can be levered open with a terminal screw driver.
3. Inside the draw is a spare fuse of the correct type. The fuse at the front of the draw is the spare, the fuse at the back is the one in use.
4. Remove the damaged fuse and replace it with the spare, ensuring that a replacement of the correct type is obtained, the specification for which is given in Section 2.1 of this user guide.
5. Before switching back on, inspect the case and its controls for a possible reason for the fuse failure.
6. If the case continues to blow fuses, return the case to **ALSTOM** at the address shown on the rear cover of this guide.

6.10 Failure of CDC Board (❸) Firmware

6.10.1 General Description

Should a fault develop in the CDC firmware, normal software operation will stop. If a DDM™ is plugged in it will display:

```
FIRMWARE INTEGRITY
      FAILURE
      (E000)
  SEE USER MANUAL
```

To assist ALSTOM personnel in diagnosing the cause of the software malfunction, the memory contents of the drive can be uploaded to a PC as shown in Section 6.10.2 and sent to ALSTOM at the address shown on the rear cover.

6.10.2 Uploading the failed CDC Board (❸) firmware diagnostics

Proceed as follows:

1. Connect the COM port of a PC to the RS232 port of the drive (DDM™ port). A pin-to-pin 9-way D-type lead is required (the DDM™ lead supplied with the case will work).
2. Run a simple terminal program on the PC (Telix, Windows Terminal etc.).
3. Set the COM port parameters to 9600 baud, no parity, one stop bit.
4. Set the terminal program to upload an ASCII file to disk.
5. Press **'G'** on the PC to start the upload.
6. The drive will then upload its entire memory map to the PC (takes about 10 minutes).
7. The upload can be terminated at any time by pressing **'E'** on the PC.
8. When the upload is complete, the produced file (about 1MB large) should be E-mailed to ALSTOM for analysis (preferably compressed with PkZip/WinZip).
9. The CDC Board (❸) software can then be re-started by pressing **'.'** on the DDM™ or the PC, whichever is connected.

7. Accessories and Spares

7.1 Accessories

7.1.1 Accessory listing

The parts listed below are standard ALSPA MV3000 parts. Some of these items will have been included in the case at the time of purchase (see section 3 for details). The numbers are provided to allow additional or new items to be ordered.

Item	Part No.	Description
ALSPA MV3000 Drive Data Manager™ (❾)	MVS3000-4001	A multi-function unit with Keypad functionality that can be used to edit and monitor drive parameters, extract warnings and trip reports, and provide parameter specific help. The DDM™ has a large, easy to read, backlit display and can be mounted to the case, held in the hand or permanently mounted on any suitable surface. The DDM™ incorporates special keys to start and stop a motor, and to control its speed.
ALSPA MV3000 Drive Data Manager™ Lead and Door Mounting Kit	MVS3001-4001	A DDM™-to-drive interconnection cable, mounting gasket and drilling template to allow the DDM™ to be mounted on a flat surface, e.g. the cabinet door. Note: The case only includes the lead as standard.
ALSPA MV3000 direct FIP communications card Serial link support plate	MVS3002-4001 029212981	When connected to the CDC Board (❸), underneath the perspex cover (❷), the case can be connected directly to a FIP fieldbus. A special bracket which is required to support the FIP card, order these items together.
Demonstration case user guide	T1691	Another copy of this guide might be required.
ALSPA MV3000 Getting Started Manual	T1676 EN,G,F	The manual shipped with the ALSPA MV3000 drive. English, German and French versions are available.
ALSPA MV3000 Hardware Technical Manual	T1678 EN,G,F	Full installation manual for the ALSPA MV3000. English, German and French versions are available.
ALSPA MV3000 Software Technical Manual	T1679 EN,G,F	All parameter and function explained in full. English, German and French versions are available.

7.1.2 Fitting Communication Accessories after sale

Most of the accessories described above are included with the case, extra details can be found in Section 3.4 of this guide. Communications cards (like FIP) however, may be purchased at a later stage, proceed as follows:

1. Remove power from the case before proceeding.
2. With an anti-static wrist strap fitted, remove the perspex cover (❷) over the CDC board (❸) by carefully pulling upwards, the plastic rivets will slide out of the pillars.

3. Undo the M4 nut positioned behind TB2 on the CDC (❸).

4. With an anti-static wrist strap fitted, Fit the Serial link support plate using the M4 nut removed above, the communications card will steady the plate when fitted.

5. With an anti-static wrist strap fitted, fit the communications card into the 96 way connector and into the Serial link support plate, following the instructions supplied with the card.

6. Carefully slide apart the plastic rivets on the perspex cover (❷), but do not completely separate them, this will make the end of the rivets small enough to slide back into the pillars.

7. Re-fit the perspex cover (❷) by locating the plastic rivets into the pillars and pressing the top of the rivet firmly home, this will expand the rivet again allowing it to grip the pillar.

8. Switch the case on and follow the operating instructions supplied with the communications card.

7.2 Spares

The only item which is user changeable in the demonstration case, is the mains fuse. The fuse is stored in the mains inlet (❹). A spare fuse is supplied with the case, for details on fuse changing, see Section 6.9. The fuse used is an easily obtained proprietary one, the details of which can be found in Section 2.1 of this guide.

8. Disposal

This equipment or any part of the equipment should be disposed of in accordance with the laws of the country of use.

Modern high technology materials have been used in the manufacture of the equipment to ensure optimum performance. Care has been taken with the selection of these materials to minimise risks to health and safety. However, some materials require special consideration during disposal.

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DIAGNOSTIC HINTS

Note: These hints are aimed mainly at the DEFAULT case, to help with problems which may be experienced while working with this user guide.

Problem	Possible solution
Case not powering up	Check the fuse in the UK mains lead. Check the fuse in the mains inlet (❹), ensure the mains switch is on and illuminated. If the transportation recommendations in Section 3.3, have not been followed, adverse effects to the case internal power supply may have occurred, thus blowing the fuse. Change the fuse, allow the case environment to stabilise, then try again.
Healthy LED is not lit.	Ensure the “switch on” procedure in Section 4.2 has been followed. View the trips and determine the cause, remember, that programming the parameters in the case can cause a trip to be permanently set (for example, incorrect use of the user trips), so a parameter default may be necessary.
The case will not run from the Keypad.	The drive must be in "Keypad control" (i.e. Local control). Check that DIGIN 4 is open. Use a DVM or view P11.21. DIGIN 4 is connected to CF116 which selects local/remote (LO/open for keypad). See Section 5.1.10 for a detailed look at local /remote control.
The case will not run from the terminals.	The drive must be in "Remote control". Check that DIGIN 4 is closed, use a DVM or view P11.21. DIGIN 4 is connected to CF116 which selects local/remote(HI/closed for remote). See Section 5.1.10 for a detailed look at local /remote control.
All LED's flashing	This indicates a major software or hardware fault with the controller. Normal software operation cannot continue. Refer to Section 6.8.1.
The speed reference is not working.	The default drive has 3 speed references programmed: a) Local (Keypad) reference value entered in P1.00 b) Remote ANIN1, programmed to be 0 - 10 V, view value in P11.36 c) Remote ANIN2, programmed to be 4 - 20 mA, view value in P11.37 • Monitor P9.00 whilst operating the required reference. • To achieve Keypad reference, ensure DIGIN 4 is open. • To achieve any Remote reference, ensure DIGIN 4 is closed. • To select between Remote references ANIN1 and ANIN2, toggle DIGIN 5. • See Section 5.1.10 for a detailed look at local /remote control.
The analogue input references are not functioning as expected.	The default setting for ANIN1 is 0 - 10 V (0 - 100%) and the default for ANIN2 is 4 - 20mA (20% - 100%). The DIP switches configure the inputs for current or voltage. • Check the DIP switches (⑥) against the graphic on the panel. • Check the analogue input settings in P7.00 to P7.07 against default settings. • Check the values entering the analogue inputs in P7.03, P7.07 respectively. • See Section 5.2.4 for a detailed look at Analogue I/O.
The analogue outputs are not functioning as expected.	The default settings for ANOP1 and ANOP2 are 0 - 10 V, 0 - 100%. The DIP switches configure the outputs for current or voltage. • Check the DIP switches (⑥) against the graphic on the panel. • Check the analogue output settings in P7.17 to P7.26 against default settings. • Check the values coming from the analogue outputs in P7.21, P7.26 respectively. • See Section 5.2.4 for a detailed look at Analogue I/O.
Deceleration ramps not being followed, seems to take longer than set.	The drive is programmed at the factory to prevent itself tripping on overvoltage trips. When an AC motor is decelerated, the motor generates voltage back to the drive DC link, the amount of voltage depends on the speed of the deceleration and the load inertia. The case can simulate this effect by the set level of the DC Link Feedback (⑦). If the time taken to ramp down is too long: • Check the deceleration rates set in P1.23 or P6.02, P6.03 (duplicates). • Check the value of the DC link feedback in P11.03, adjust the relevant power frame simulation panel (⑦) pot to give about 460V. • Check the value set in P4.12 and adjust it up, this tells the software to absorb more simulated watts, thus allowing the required deceleration to occur.
Case trips when the keypad (❾) is removed.	For safety on a real plant, it is not allowed to simply remove the keypad if the keypad has control of the start/stop or is the source of the speed reference. There is a procedure described in Section 4.5.5. Note if the keypad is not in control, or is not the speed reference, then it can simply be removed without a problem.

CASE WARNING & TRIP CODES

This is not a full list of ALSPA MV3000C fault codes, these codes are the only ones which are relevant to the case.

WARNING CODE	TRIP CODE	WARNING/TRIP DESCRIPTION	CASE CONTROL RESPONSIBLE, DIAGNOSTIC HINT
-	1	Interlock	Plant interlock (②) has been pressed
105	2	Reference Loss	The primary reference has been lost, e.g. 4-20mA (⑩) switched off
-	3	DC Overvolts	DC Hardware Overvoltage switch is open (⑦)
-	4	DC Undervolts	DC link feedback is to low (⑦)
107	6	High/Over Temperature	Any of the temperature feedbacks (⑦) is too high, use menu 11 to solve
-	7	Instantaneous Overcurrent	Over current switches U,V or W open (⑦)
-	9	U-Phase - HW OverTemp	O/P Hardware OverTemperature switch is open (⑦)
-	15	Auxiliary ±15 V Fail	Internal CDC board (❸) voltage has failed
-	16	Auxiliary 24 V Fail	The user 24V has failed, check the mains fuse (❹)
-	18	History Restore Fail	At power up, the history record could not be recovered. INFO. only
-	20	Parameter Edits Lost	All parameters will be at default, restore backups made using P99.16
100	21	Motor Thermostat	Motor thermostat has opened. Block diagrams sheet 7, P21.10, P2.11
112	23	RS232 Loss	RS232 link has timed out, see menu 32, Block diagrams sheet 2
113	24	RS485 Loss	RS485 link has timed out, see menu 32, Block diagrams sheet 2
-	25	Internal Reference Fail	CDC board has failed, return the case for repair.
108	26	Low/Under Temperature	I/P Temperature feedback pot is set low (⑦)
-	27	Keypad Loss/Removed	Keypad (❾) removed without authorisation, see Section 4.5.5
-	30	Drive ID Violation	P99.13 is not equal to P99.14
-	58	Current Control Fail	Trying to run the case in vector mode causes this trip (P99.01)
-	60	Unsuitable Motor	The motor parameter data entered into menu 12 is not suitable
-	61	Encoder Loss	The speed feedback source (P13.00, P13.01) has been set to encoder, the case has no encoder
-	62	User Trip 1	Control Flag 10, or something connected to it = HI
116	63	FIP Loss	The FIP link has failed, if used
129	65	Load Fault - Low	Load fault detection (menu 43) has detected low current, the case cannot simulate any motor current
103	66	Motor PTC	The motor thermistor control (④) is set too high, see P2.14
104	67	DB Resistor	This fault can occur if the DC link Feedback is set too high (⑦) and the output is running, a Warning seen at 25% dissipation remaining.
-	70	Datumize Error	Only possible if a datum movement has been requested in position control (block diagrams sheet 9). The case has no encoder.
-	71	Speed Feedback Loss	Only possible in vector control (P99.01 =2)
-	73	User Trip 2	Control Flag 112, or something connected to it = HI
120-125	150	Internal Software/PWM Error	Please report this problem to **ALSTOM**
	151	DB Overcurrent Trip	D.B. Overcurrent switch is open (⑦)
	152	DB Hardware OverTemp Trip	D.B OverTemp switch is open (⑦)

VIEWING WARNINGS AND TRIPS MENU 10

Parameter	View
10.00 - 10.09	Warning Nos. 1 - 10
10.10 - 10.19	Trip Nos. 1 - 10
10.20 - 10.29	Trip History Nos. 1 - 10
10.30	Secs Since Trip
10.31	Hours Since Trip
10.32	CF10 - User Trip 1
10.33	CF112 - User Trip 2
10.34	CF9 - Trip Reset

HISTORY

THE DRIVE IS EQUIPPED WITH A 10-CHANNEL HISTORY RECORDER.

MENU 26 – ALLOWS SET-UP OF THE LOG

MENU 27 – ALLOWS PLAYBACK OF THE LOG

DRIVE DATA MANAGER™
KEYPAD FUNCTIONS

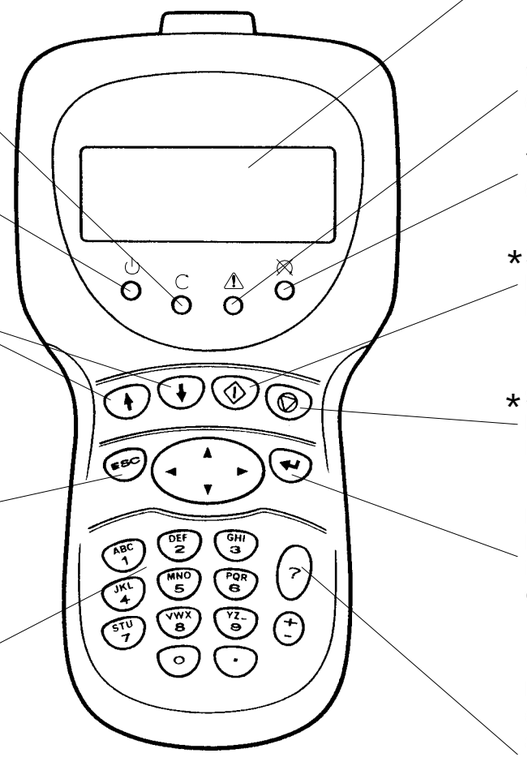
RUNNING led (Green)

HEALTHY (STANDBY) led (Green)

* RAISE and LOWER keys
Used to raise and lower the reference when keypad reference is selected as a reference source.

ESC key
Used whilst editing and navigating, see Section 4.5

Alpha/Numeric keys
Used whilst editing or short cutting parameters



4 line 20 character backlit Display

WARNING led (Yellow)

TRIPPED led (Red)

* START/RUN key
Press to run the output bridge when in keypad

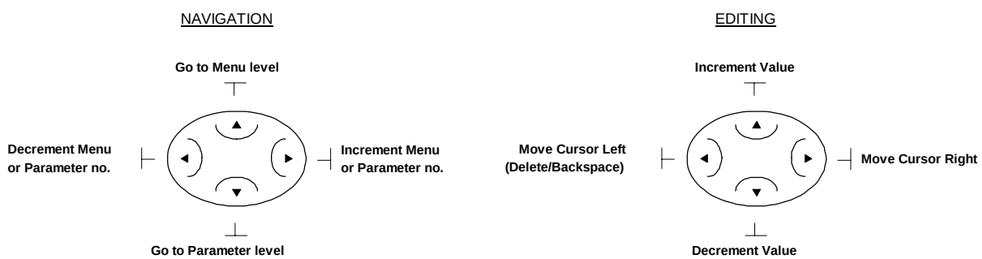
* STOP key
Press to stop the output bridge when in keypad

ENTER key
Press to enter a menu, to initiate editing or to load an edit.

HELP key
Press to get context sensitive diagnostic help when either a trip or a warning is displayed. Parameter help is also available.
see Section 4.5.4 and Section 6.

* At Default, DDM™ (Keypad) control is selected by digital input 4, which in turn operates Control Flag 116. Keypad reference is also selected by digital input 4. Refer to Section 5.1.10 and the control block diagrams, sheet 3, for more information.

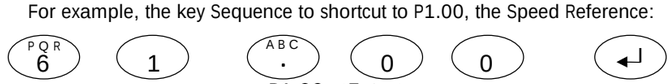
THE NAVIGATION KEY



SHORTCUTTING TO PARAMETERS

If the parameter number is known, it can be entered directly using a shortcut method.

For example, the key Sequence to shortcut to P1.00, the Speed Reference:



See over for Diagnostics and Help

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